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A VINDICATION OF A LATE ESSAY ON THE *Tranſmutation of* BLOOD,

CONTAINING

The true Manner of DIGESTION of our
Aliments, and the Ætiology:

OR,

An ACCOUNT of the Immediate Cauſe of
Putrid FEVERS or AGUES.

As alſo Obſervations upon the Noble Specifick

CORTEX PERUVIANUS.

To which is Added, (By Way of **Appendix**)

A DISSERTATION concerning the Manner of the Operation of *CHALYBEAT MEDICINES* in Human Bodies, in oppoſition to the receiv'd Opinion of their operating by their ***Pondus***, *&c.* Founded upon experimental Obſervations and demonſtrable Principles, the ſole Original and Fundamental of true Knowledge, which our Senſes are Witneſs to.

Ἢν ἐς τὴν κοιλίην αἷμα ἐκχυθῇ παρὰ φύσιν, ἀνάγκη ἐκπυηθῆναι.
Hipp.

By *THOMAS KNIGHT*, M. D.

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To the very Learned and Judicious

Dr. JOHN HOLLINGS,

Fellow of the Royal College of Phyſicians,
and of the Royal Society;
Phyſician in ordinary to His Majeſty,
and Phyſician General to the Army.

SIR,

I Have in the following Eſſay and Diſſertation, endeavoured to improve the *Hypotheſes* and Theories concerning Chylification, or the Diſſolution of the

Aliments; and the Series of Changes they ſucceſſively undergo from their being taken at the Mouth, till they are turned into Blood: And the Manner how Blood changes into *Pus*.

And I have alſo enquired into the Nature and Exiſtence of the ſuppoſed animal Spirits: The Poſſibility and Method of curing external Ulcers of the Lungs: The immediate Cauſe of putrid Fevers or Agues; and the Manner of the Operation of *Cha-*

lybeat Medicines in human Bodies.

Some of theſe Subjects that ſeem'd undetermin'd, and left in an ambiguous myſterious Manner, are illuſtrated and ſet in a ſtronger Light; and others eſtabliſhed upon new, ſolid, and laſting Foundations, by grounding my Theories upon real and not imaginary Principles.

But the whole is entirely ſubmitted to Your Cenſure, as being a moſt proper Judge both of the Nature and Force of my Arguments; and if they have Your Approbation to be juſt and reaſonable, it will undoubtedly give the whole a Sanction. I am, with great Reſpect,

SIR,

Your moſt obedient

humble Servant,

THOMAS KNIGHT.

THE

PREFACE.

THE *honourable Mr.* Boyle *has given us the Natural Hiſtory of human Blood of healthy Men, in order to ſerve for a Direction to any that wou'd write the Hiſtory of morbid or depraved Blood in any particular Diſeaſe, as a Pleuriſy, a Quartan Ague, the Dropſy, the Scurvy,* &c. *and thought it an Omiſſion that ſo important a Subject had not been more skilfully and induſtriouſly inquir'd into.*

The moſt conſiderable real Diſcoveries that have been lately made, have *been in Anatomy, rather than in the Humours, Spirits, and Blood, which are the principal Seat of Health as well as Diſeaſe: And for want of improving our Knowledge of the Nature of the Blood, gave occaſion to many Errors in our reaſoning about the Effects which Medicines produce in our Bodies.*

Therefore how neceſſary it is for a Phyſician to know the Nature of human Blood, as well as the Anatomy of the ſolid Parts, ſince all Diſtempers are owing to a Vitiation of the Quantity, Quality, and irregular Motion of its Fluids, or to a bad Diſpoſition and Texture of their Channels.

In order thereunto I have carefully enquired into the Manner of the Diſſolution of our Aliments into Chyle, and the Manner of the Aſſimilation of Chyle into Blood: And have prov'd by Experiments that our Aliments in the

Stomach are reduc'd into eſſential Parts, and that by Putrefaction or inteſtine Motion: And that the Action of the Stomach is very different from what it is generally deſcribed to be, and that it is not neceſſary in that incredible computed Degree; nor is it neceſſary that the Subſtance of it ſhould be of that Porphyrite Nature as to levigate, grind, and comminute the ſolid Parts of animal and vegetable Subſtances into ſimilar or integral Parts, or ſuch as retain the ſame Nature with the whole.

For they are diſſolv'd into diſſimilar, or eſſential Parts or Elements, and that by deſtroying the Texture and Continuity, or ſpecifick Degree of Coheſion: And being thus acquainted with the Nature of the Blood which is the common Promptuary of all the other animal Fluids, we ſhall be better able to judge of the Exiſtence and Non-exiſtence, and of the Nature and Quality of the Fluids thence proceeding.

Several have ſuſpected the Exiſtence of the Spirits [*]*, becauſe they are not viſible, nor does any Ligature or Tumor in the Nerve diſcover their Motion: But in a more particular Manner, Dr.* Cheyne *in his Eſſay on the Gout* [†], *has demonſtrated by Experiments, that the Muſcles in Contraction ſink into their own Subſtance, and that it is an extrinſick Principle, and not the animal Spirits, that were thought to be conveyed into the Body of the Muſcles, to occaſion an Inflation and Contraction in ſuch Parts by rarefying the Blood to expand it ſelf,* &c.

And he farther tells us, that the nervous Fibres are not pervious or hollow to receive any: Which is contrary to the Preſcription of all our modern and moſt accurate Anatomiſts; but he ſupports

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[*] Quid ergò miri, ligaturas, puncturas, ſectiones nervorum non reddere ſenſilem hujus liquidi præſentiam, motumve? H. Boerhaave, pag. 71. Inſtit.

[†] The fifth Edit. pag. 91. §. 60.

ſupports his Argument with a Name of very great Authority, Leeuenhoek, *who has ſeen farther than moſt Men, by the Help of his Glaſſes.*

Others have ſuſpected that the Blood doth not at any time putrify both extra *and* intra vaſa, *and ſeem inclin'd to believe that it has loſt entirely its former Tendency to a coagulatory Separation, ſuch as in Chyle and Milk they have; in the ſpontaneous Separation or Curdling of which latter there is a Concurrence of a manifeſt Acid.*

Some of our moſt eminent Phyſicians have given us an Account what Plants and chymical Medicines alter the Blood, as to coagulate or attenuate: But my Deſign here is to ſhew how the Blood, of it ſelf innoxious, by undue Retention is alter'd and become hoſtile, which ill Qualities are the proximate Cauſes of diverſe Diſeaſes, as a Pleuriſy,

riſy, Peripneumony, putrid Fevers and Agues, &c.

In theſe the Humours, or Part of them, have ſo little circulatory Motion, that they fall into an inteſtine one, and putrify: For where-ever the Blood ſtagnates, it will be coagulated and corrupted, though the Thing that caus'd the Stagnation were not the immediate Cauſe of the Coagulation and Corruption.

It is very difficult to follow Nature in her moſt ſecret Elaborations, *but the divine* Hippocrates, *by juſt Obſervations, has traced her Footſteps, and found the Origin and Cauſe of every Change: So that we are not a little obliged to him, and* Galen *his beſt Interpreter, and others; tho' a late Author makes 'em to be of little Worth, having barely given us a Narrative of Facts or Incidents. Undoubtedly*

edly they have laid a good Foundation to ground our Theories, for we are to ſquare our Reaſonings to Facts; for where Fact appears, Reaſon falls to the Ground.

This was Ariſtotle's *Fault; for he having fram'd a Body of Phyſics out of his own Head, was for condemning all that was not conſonant to his own Principles, out of no other Motive, but becauſe they were not agreeable with the Foundations himſelf had laid; ſo that all the various* Phænomena *of Nature were to be ſuited to his Philoſophy, inſtead of his Philoſophy being drawn from Obſervations in Nature.*

Dr. James Keil *well obſerv'd "That "Phyſick ſeems in nothing ſo defective "as in the Knowledge of the Nature "of Blood: And that our Indications "are true and juſt, ſo far as our "Knowledge of the Animal* OEconomy

“ *reaches; but where it leaves us,*
“ *we only grope in the Dark, and find*
“ *out Remedies by Chance.*”

“ *But this will be ſtill more evi-*
“ *dent, if we conſider, there is no*
“ *Diſeaſe better known, or which has*
“ *its moſt minute Circumſtances better*
“ *deſcribed than a* Tertian *Fever;*
“ *yet becauſe we are ignorant of the*
“ *Nature of the Blood, which is the*
“ *Seat of the Diſeaſe, its Hiſtory*
“ *doth not help us to any* Indication,
“ *which if anſwer'd will work a Cure;*
“ *but we are obliged to the ignorant*
“ Indians *for our Knowledge in cu-*
“ *ring this Diſeaſe.*”

To enumerate the various Opinions of Authors concerning the Bark, is endleſs and to little Purpoſe. For altho' it has been made uſe of with wonderful Succeſs, in intermitting Fevers, and other Diſeaſes, it always operated by an occult Quality.

Thus when we cannot readily account for Operations in Nature, particularly the ſudden Effects of this Medicine, we fly to a Materia ſubtilis, *and content our ſelves with occult Quality; but at this time being let into the Secret of the Tranſmutation of Blood, the Operation of the noble ſpecifick* Cortex Peruvianus *will be no longer a Myſtery, and will cauſe a great many Difficulties about the Cauſes of Diſeaſes, and the Manner of the Operation of Medicines to vaniſh.*

The ſame worthy Author * *in his Appendix to* The natural Hiſtory of human Blood, *doth declare, that the Defectiveneſs of our hiſtorical Knowledge of human Blood extravaſated, has been ſuch that among the Authors he had occaſion to peruſe, he met with ſo few Maters of Fact delivered upon our own Knowledge, that what he*

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* The honourable Mr. *Boyle.*

he thought fit to tranſcribe out of their Books was very inconſiderable.

It may ſeem a Wonder that amongſt the vaſt Multitude of Books, wherewith the World does abound there ſhould be ſo little written of this Subject here inſiſted upon being it ſelf of ſuch great Importance and general Concernment to all the Gentlemen of the Faculty, in order to make proper Applications to work a Cure.

Longer Time and maturer Thinking have ſhew'd the Imperfections of the former Edition, beſides Typographical Errors: Therefore thought it neceſſary to illuſtrate the whole, by being more particular in citing the Sentiments of the moſt Learned and Judicious upon the Subject, (eſpecially what has been publiſhed ſince the firſt Edition, touching this Subject) with Reflections thereon, partly to ſupport my own private Opinion,

Opinion which I ſhall be ready upon all Occaſions to ſacrifice to the much wiſer Determination of my Superiors, and thoſe of more diſcerning Judgments.

And if I have fail'd in my Performance (either as not being copious, or for want of due Ornaments of Purity of Stile) it is only to be regretted, and to be wiſh'd that others will improve and ſet it in a clearer Light.

I ſhall not follow the Faſhion to contemn any one; for a Difference in Opinion ſhould not infringe the Laws of Charity in any Diſputes, neither ſhould it cauſe the unneceſſary Digreſſions, and Parentheſis on the Party, which is often as large as the main Diſcourſe upon the Subject.

What Reflections are made in order to rectify the Miſtakes of thoſe who *treated upon theſe Subjects, are (I hope) in as inoffenſive a Manner as the Nature of my Deſign will admit; for I don't approve of others taking the Liberty to ſpeak of worthy Authors, after a deriding Manner, writing voluminous Books, compounded of crude and undigeſted Notions, and Swarms and Millions of Rhapſodies: Are they not begotten to diſtract and abuſe the weaker Judgments, and tire the intelligent Reader?*

Thus they canvas Matters, and think themſelves capacitated to diſcuſs all Points, and ſolve all Problems, and that ex tempore; *laying down Precepts, Admonitions, and ſalutary* Innuendo's *couch'd in Allegories and Alluſions: Tho' others (ſenſible of their own Incapacity) are obliged to have an implicit Faith, in proportion or according to the Character of the Author; therefore whatever Doctrine is ill-grounded, it ought (being of the laſt Importance)* *to be decry'd and rectified, leſt it ſhould lead them into Errors.*

Let us ſuppoſe a Phyſician to have a competent Share of Knowledge in the medical Art, and has judg'd right in the General; yet he may not be ſo infallible as not to err in one Point if not more. But what is here inſiſted upon being ſhort, I hope that it is well digeſted, and being founded upon the moſt abſolute and concluſive of any Propoſition, ſelf-evident Principles, ſhall have no Reaſon to retract from what is herein aſſerted.

Thus have I endeavour'd to improve my Underſtanding (by not allowing a receiv'd Opinion to have with me the Authority of Reaſon) and am deſirous to communicate my Diſcoveries to thoſe, who, like me, may be led into it, in order to be better inform'd; which is the higheſt of my Wiſhes.

And if this Tract will ſet others upon improving the ſmall Knowledge we have of human Blood, I ſhall have my Aim; for I am none of thoſe whoſe Genius are confin'd within the narrow Limits of Things already known, and whoſe Self-ſufficiency ſooths them with a ne plus ultra.

This Book has been ready for the Preſs many Months paſt, but the Printing was delay'd; becauſe the Printer deſired Time upon Account of extraordinary Buſineſs, and by Reaſon *of my Remoteneſs from the* Metropolis, *which gave Occaſion for Peruſals, in order to leſſen the Faults at the Preſs; being partly aſſured that what was advanced therein, was brought to a Demonſtration.*

For having purſu'd the Method, as in Mathematicks, ſo in Natural Philoſophy, the Inveſtigation of difficult Things by the Method of Analyſis, ought

ought ever to precede the Method of Compoſition, and thence drawing general Concluſions, which admit of no Objections, but ſuch as are taken from Experiments and other certain Truths.

Among the Innovations (here) is particularly that of the Digeſtion of our Aliments; yet this I will not affirm, that that old Saying, nihil erit dictum quod non dictum fuit prius, *cannot here be objected againſt me: For it has been the Doctrine of a very famous ancient Philoſopher, but rejected (as I do ſuppoſe) by Reaſon it was not eſtabliſhed upon Experiments ſufficient to explain the* Phænomenon.

The reviving and eſtabliſhing of which Doctrine by Experiments and Obſervations, upon the Principles of Putrefaction, I thought my ſelf the ſole Proprietor of: But I find that a worthy and learned Phyſician has got *the Start of me, in intimating in his* Eſſay concerning the Nature of Aliments, *viz. That Digeſtion is perform'd after the Manner here ſet forth.*

That our Aliments in the Stomach are reduced into eſſential Parts, (which is our preſent Theory) has been hinted by me in the former Edition*: But now I have eſtabliſhed that* Opinion *upon experimental Obſervations and demonſtrable* Principles*, which has given both a Name and* Solidity *to the Philoſophy of this Age, and diſcovered the Vanity of that of former Ages.*

Carnarvon,
July, 1. 1731.

T. K.

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Dr. Moulin's *Trials of the mineral Waters at* Paſſy *near* Paris; *with Reflections thereon.* 208.

Dr. Slare's *Examen of our* Engliſh Steel-Waters; *with Remarks in reference to the Doctor's Experiments.* 213.

No Metal to be allow'd of, excepting Mercury,

that

that will incorporate with the Blood, and become a Part thereof. Hence the wrong Ætiology of Mars *operating by its* Pondus. 232.

Theſe Hypotheſes *decry'd, and the Manner of its Operation rightly ſtated upon real and not imaginary Principles.* 233.

ERRATA.

PReface Page x. Line 19. for *Preſcription* read *Deſcription*. p. 22. l. 16 f. *were* r. *cohere*. Preface to Diſſertation. p. iv. l. 15. f. *croſs* r. *groſs*. p. 207. l. 2. dele *and*. p. 216. l. 9. r. *may not be*.

A
VINDICATION
OF A LATE
ESSAY
ON THE
Tranſmutation of Blood, &c.

BEFORE we enter upon the Subject of Tranſmutation of Blood, it is neceſſary to premiſe that of Chylification and Sanguification.

The Manner of the Diſſolution of the Aliments into Chyle has not as yet been ſufficiently demonſtrated, but the moſt modern and general Opinion amongſt almoſt all the Philoſophical Men, is, that Digeſtion is perform'd by Virtue of the Saliva, or Spittle, the glandular Juice of the Stomach, and of the Liquors we drink; and by the Aſſiſtance of included Air, by the Heat, Contractions and Attritions of the Sotmach, and the compreſſive Force of the circumambient Parts.

The Liquors, by inſinuating into the Pores of the Aliments, ſwell, divide, and break their moſt intimate Coheſions, by which the Air before impriſon'd in their leſs divided Parts, is not only ſet more at Liberty, but by the natural Heat it muſt neceſſarily ſuffer ſuch a Rarefaction as to burſt their Parts aſunder; ſo that nothing remains to compleat the Operation, but the continual Motions of the rough Superficies of the Stomach to grind and agitate them.

All theſe are abſolutely neceſſary in preparing the Chyle, but the Action of the Stomach is very different from what it is generally deſcrib'd to be: For the Texture and Make of this Machine ſufficiently declares, that the Operation (ſo wonderful, that it has exerciſed the Wits of all Ages to account for it) was not to be perform'd by a violent Attrition, and this may be illuſtrated by a Similitude or comparative Anatomy; that is, the ſame Parts of other Animals, which makes the Solution much more facile than by its own Structure and Formation. For,

We find by Diſſection that the Stomach of ravenous, or carnivorous Creatures and Birds of Prey, is a kind of *Veſica*; and if this Bladder was to comminute thoſe animal Subſtances which they devour by virtue of its muſcular Force, or by the Aſſiſtance of the circumambient Parts, the Preſervation and Support of the *Individuum*

duum, would (I doubt) be lamely perform'd.: And moreover, becauſe the Muſcles of the *Abdomen* and *Diaphragm* in Birds are weak, neither do they act upon the Stomach as in Men. And,

The continual vermicular Motion ariſing from the muſculous Tunicks of the Stomach in an human Body, and the alternate compreſſive Force of the circumambient Parts in Reſpiration, are but gently and ſlightly perform'd; unleſs a *Stimulus* vellicates and forces the Fibres of the Stomach into Spaſms and violent Contractions, bringing the *Diaphragm* and the Muſcles of the *Abdomen* into a Conſent of Co-operating like as in Vomiting.

But, ſhould the Force of the muſcular Action on the Food contained in the Stomach be granted to be ſo very conſiderable as to amount to, and be equal to the Preſſure of 117088 Pound Weight, as it has been computed and calculated. Notwithſtanding it is not capable of levigating or grinding the ſolid and integral Parts of animal and vegetable Bodies into ſuch minute Parts, as to correſpond with the Orifices of the Lacteals, *&c.*

And could the Structure and Mechaniſm of the Stomach, with the abſolute Force of the *Diaphragm* and the Muſcles of the *Abdomen*, excite ſuch a powerful Attrition, as might reduce them into ſuch minute Parts, how ſhould the Coats of the Stomach triturate ſuch Food as is often received into it, and which have as ſtrong a Coheſion as the Subſtance of the Stomach it ſelf, without diſſolving and wearing its ſelf by its own Action? Of which it muſt be unavoidably in great Danger, if Digeſtion was chiefly perform'd by this powerful Attrition.

But ſince the worthy Mr. *Boyle* has invented a Machine * for Digeſtion

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* Balneum Mariæ Clauſum.

geſtion, deſcribed by ***Papine***, it has been univerſally received, that Digeſtion, or Diſſolution of our Aliments in the Stomach, is chiefly perform'd by the Preſſure of rarefy'd Air confin'd: For by this Machine, without the Help of any Ferment, (unleſs an inteſtine one) but by the Aſſiſtance only of Heat and the Expanſion of the rarefy'd Air confin'd, Bones and Fleſh with the Addition of a ſmall Portion of Water, are turned into a Gelly.

The Analyſis of Air, by great Variety of chymio-ſtatical Experiments, ſhews in how great a Proportion Air is intimately incorporated and wrought into the Compoſition of animal and vegetable Subſtances; and this when rarify'd by the Heat of the Stomach muſt greatly contribute in diſſolving the Aliments in the Stomach and Bowels, by rending and tearing its Confines.

To all Bodies there concurs an Acid as a conſtitutive Principle or Vinculum, whereby the Alcali is bound into a Body. This Principle in a quieſcent State is eaſily diſſociated, unhinged, and ſet at Liberty, eſpecially by alcaline or urinous Salts, of ſuch our *Menſtruum* is compounded; theſe are what we uſe in order to facilitate the Extraction of any Part or Principle from a Concrete; they divide and looſen the Coheſions of the Parts, ſo that they readily join with that of the *Menſtruum.*

Which holds good in the Diſſolution of animal Subſtances as well as that of Sulphurs from Minerals, and of Roſins, Gums, and the like Bodies from vegetable Subſtances. For let but a Piece of Fleſh of any kind be put into a Liquor well impregnated with an Alcaline Salt, and in a ſhort time it will turn to a mere Putrilago, a Maſs of Rottenneſs and Corruption.

This ſeems to be the Principal of all the concurrent Cauſes; (in producing this ſurprizing Phænomenon, of the ſudden Diſſolution of the Aliments in the Stomach) for culinary Heat might cauſe the coil'd up Air to expand, rend and tear its Confines, and Water aſſiſts by inſinuating into the Pores, *&c.* But this is ſuch a *Menſtruum* * (as appears by Circumſtances moſt convincing) that is ſo fitted and prepared, and moſt intimately incorporated, and acuated with volatile and alcaline Salts, that it is ſuch an Alcaheſt, or univerſal Diſſolvent, that diſſociates and unlocks the moſt minute Combinations, by altering the Property of the acid Principle and *Vinculum* that enters

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* Quæ (alteratio) in ore agitur, mutat quidem id (nutrimentum) in alteram ſpeciem manifeſtè, non tamen ad perfectionem tranſmutat - - - - - - - - - Galen Lib. de Neutralibus Facultatibus.

Actioni huic velificatur ſaliva, primum illud naturæ Menſtruum, quod texturam, ſolvendo & vincula relaxando, alimentis aliam planè conciliat faciem ut ea ſemel imprægnata vix amplius cognoſci aut à corruptione, *&c.* Waldſmidt. Opera Med. Tom. 2. fol. 85.

ters into the Compoſition of Animals and Vegetables.

But neither this, nor Maſtication, nor the Heat, Contractions and Attritions of the Stomach, nor the united Force of the *Diaphragm*, and the Muſcles of the *Abdomen* (which likewiſe contribute to Digeſtion) is ſufficient to grind, tear and comminute the Aliments into thoſe little Bulks, or minute Parts, as to correſpond with the Orifices of the Lacteals to become a Part of the circulating Fluid, in order to be converted into Blood.

Neither is the ſolvent *Menſtruum*, and all the concoctive Powers able to break and divide the Food, into Parts ſmall enough to run into red Globules, or circulate through the ſmall Veſſels. Neither is it to be ſuppoſed that the little Bubbles in the Blood are the ſolid and integral Parts, or *Ramenta* of carneous and vegetable Fibres from the Food; for it is certain that they are not ſolid Particles, from their uniting as they approach and touch, like Spheres of Quickſilver, changing their Figures into oblong Spheroids as they paſs thro' the capillary Veſſels, and when they are come into more ſpacious Tubes return ſpherical. All theſe are Properties belonging to Fluids and not to ſolid Bodies, which are devoid of this Vacuity impleted and filled with a ſubtile elaſtick *Aura*.

But this is the general Opinion, and has been a conſtant Doctrine, that the Parts of the Food, by the Concoction of the Stomach are divided only into ſimilar or integral * Parts, or ſuch as retain the ſame Nature with the whole, not differing from what they were before, but in obtaining leſſer Bulks, and are not diſſolved into diſſimilar or eſſential Parts or Elements, whether chymical or any other, by the Aſſiſtance of any Ferment in the Stomach; that is to ſay, by a Separation of ſome Parts of different kinds combined together and an Union of other Parts before in Separation, as it happens in all Fermentation or inteſtine Motion of Bodies, as tends to the Deſtruction of that Form of their Exiſtence, which is ſaid to be their natural State.

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* Cibi comminuuntur in partes integrantes totis ſuis ſimilis, ſed minores, eo prorſus modo, quo Corallium ſuper marmore inſperſâ aquâ teritur, reduciturque in pulverem impalpabilem, cujus partes ſunt parva Corallia, & non Corallii principia nexu ſoluta. Element. Medicin. Archibald Pitcairn. Cap. V. De OEconom. Animali.

The foregoing Proceſs of the Diſſolution of the Aliments is inſufficient; for the Cauſes aſſign'd for it are not adequate to the Effect: Therefore I ſhall add in this Place ſome ſelect Inſtances, which may farther illuſtrate the Doctrine of the Concoction of our Aliments, and demonſtrate that they are diſſolved into eſſential Parts, and that by Fermentation or inteſtine Motion.

I ſhall proceed and ground it upon theſe following Propoſitions *.

1. All thoſe things which are capable of Digeſtion within the Animal, are capable of Corruption out of it.

2. Thoſe things which are out of the Force of Circulation, ought to be accounted out of the Animal, altho' they are within a living Body.

3. Thoſe things that are carried thro' the inteſtinal Tube, are out of the reach of Circulation.

Hence it follows by neceſſary Conſequence, that all things putrify without the Animal, that is in the firſt Paſſages; and though we have not uſed the Word Fermentation, yet we don't ſuppoſe the Diſſolution of the Aliments within the Stomach can be done without an inteſtine Motion of their Particles; for all things, as the Fleſh of dead Creatures, Herbs, *&c.*

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* Vid. Element. Medicin. Archibald. Pitcairn. Propoſition. cxxviii. &c.

putrify when out of the Verge of Circulation; the Principles diſengaging and extricating from the Embraces of the component Parts or Principles; and by the Humidity and Heat of the Stomach this inteſtine Motion is raiſed and accelerated.

The greateſt Part of our Aliments are Fluids coagulated and in a quieſcent State, and it is well known how ſoon an inteſtine Motion of their conſtituent Parts is excited when diluted, eſpecially by the aſſiſtance of Heat; the more ſpirituous and ſubtile Particles are put into Motion, by this means a Fermentation is carried on, and though it be in never ſo low a Degree may be juſtly call'd Fermentation: And no doubt but that there is ſuch a Separation of Parts, that the Oil or Sulphur, Water, and Salt (which are the principal Materials of Animals and Vegetables, and the predominant Principles that conſtitute the Blood of Animals) are ſo far extricated or diſengaged from the Embraces of the component Parts or Principles, as to form that lacteſcent Liquor Chyle, which Colour is the reſult of ſuch a Mixture.

For farther Conviction of this, and clearing up all poſſible Objections and Difficulties, the Chyle always appears white in the *Venæ Lacteæ* and *Thoracick Duct*, and by microſcopical Obſervations appears to be diſengaged Principles, to wit, ſmall diaphanous Globules, ſwimming in a limpid Fluid *.

The Antients (and even *Hippocrates* † himſelf) thought that Concoction was performed by the Heat of the Ventricle only. But which created a Difficulty, even to them, was; that they ſaw a great many Animals, in whoſe Ventricle they could not obſerve any Heat; as for inſtance in Fiſhes, which notwithſtanding did not want Concoction, nay, had as good a one, as thoſe where the Heat is greateſt of all. Wherefore to ſurmount this difficulty without ſhifting it off, they aſſign'd a Reaſon for it, by ſaying that it was a particular Heat.

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* Chylus eſt fluidum ex globulis diaphanis per liquorem cryſtallinum agitatis——— & pingues Chyli particulæ in bullulas ſive veſiculas ab aeris Atomis reducuntur. Bohnius.

† Libro de ſalubri Victûs ratione. Sect. 4.

But *Empedocles* the famous antient Philoſopher of *Agrigentum* in *Sicily*, that wrote of the nature of things, taught that nothing living ought to be eaten, and that Digeſtion was perform'd by a Putrefaction of the Aliments *. This wonderful Man † has aſſign'd the proper, immediate, and phyſical Cauſe of the ſudden Diſſolution or Concoction of our Aliments; and this we ſhall not aver gratis, but explain by what Means effected, and prove the Certainty of it by Experiments.

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* Vid. Heurn. Inſtitut. Med. lib. iii. de Facultat. pag. 89. Empedocles Philoſophus putrefactione cibos coqui putabat, cujus opinionem ſequuti Veteres, ἄσηπτα vocabant, quæ nos ἄπεπτα.

† ——— Deusimmortalis haberi. Horat. de Arte Poet.

But I would not be underſtood to recommend for proper Food, ſtale Fleſh, Fowl, or Fiſh, and other corrupt and ſtinking Meats (*Eſt modus in rebus*) though common Obſervation makes it plain and obvious, that common Poultry, (and full grown and adult Animal Food) that have lain by for ſome time, are not only eaſier maſticated, but likewiſe ſooner concocted in the Stomach, *&c.* becauſe their Parts cohere leſs firmly.

Therefore it is a juſt and natural Conſequence, in regard of the things to be concocted or digeſted, that ſome kind of Food ſhould be kept for ſome time, 'till inteſtine Motion is begun, and in ſome meaſure carried on (for the finer the Chyle will be, and the Circulation the more free, *&c.*) and this is brought about ſooner or later according to the Seaſon, or as to the Degrees of Heat and Cold. But ſuch as are already become Chyle, either by Nature or Art, do not require any ſuch Preparation.

This is conſiſtent with our Theory, and Experience has regulated this Affair, as to what will keep a few Days or Hours inodorous, ſweet, and better qualified and prepared for Digeſtion; and thoſe things that are of a looſe and lax Texture, (as ſeveral kinds of Fiſhes and young Animals and Vegetables) ſuddenly running into Diſſolution and Putrefaction, and eaſily reduced into their component Parts; which will not keep, but muſt be toſs'd up forthwith, in order to retain a Firmneſs and an Agreeableneſs to the Palate.

'Tis well known that our Aliments, both animal and vegetable, tend to Putrefaction and Diſſolution, and that they are already prepared and made of a lax or looſe Texture; which readily falls aſunder in obedience to Maſtication, and to the muſcular Force and Action of the Stomach, *&c.* The Staff of Life, namely, all the kinds of Grain for Bread; have paſs'd the Mill, and are already fermented, and the tender Leaves, or young Sprouts of Plants, and other vegetable Foods, as Sago, Rice, *&c.* are eaſily diſſolv'd into their component Parts.

The animal Subſtances are in a ſtate of Putrefaction which is a Species of Fermentation, (if I may ſo call it) which commences as ſoon as they are depriv'd of the progreſſive Motion of their Fluids. For with what difficulty all theſe in warm Weather * are preſerv'd and kept from putrefying, their Salts are diluted and their Sulphurs ſo rarefied, exalted and ſubtiliz'd by Heat, and by the inteſtine Colliſion, as to float in the Medium Air, aſſailing the Olfactory Nerves.

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* Si quis radiis ſolaribus per aliquot horas carnem recentem expoſuerit, ſtatim fit putrida, &c, Waldſchmidt. Oper. Med. Tom. 1. pag. 792.

This ſhews how eaſily an inteſtine Motion is excited and accelerated, by the aſſiſtance of Heat; the more fine and ſubtile Parts, as are moſt ſuſceptible of Motion, and diſpoſed to ferment, are more immediately diſentangled unbending the Spring of the included and coiled up Air, which muſt contribute to the Fermentation, Rarefaction and Comminution of the whole.

The Air being intimately wrought into the Compoſition of animal and vegetable Subſtances, greatly contributes in a fixed ſtate to the Union and firm Connection of the ſame. And this Bond of Union in conjunction with the external Air, is alſo a very powerful Agent in the Diſſolution and Corruption of the ſame Bodies, for it makes one in every fermenting Mixture; the Action and Reaction of aerial and ſulphureous is in many fermenting Mixtures ſo great as to excite a burning Heat, and in others a burning Flame.

The acid Principle and Vinculum, that enters into the Compoſition of all natural Bodies manifeſts its ſelf by Fermentation : for Chyle and Milk, and even the moſt pure elementary Water (which is an *Aggregate*, or *Compoſitum*) is not void of this Principle, though not to be diſcover'd by any chymical Proceſs, 'till it has undergone a Fermentation : Then it diſcloſes new Scenes *, and yields a Spirit †, but before Putrefaction, it paſſed the force of the Fire combin'd.

We find that this Principle (which is properly called *Anima Mundi*, or Soul of the World) is inherent in all animal, vegetable, and mineral Subſtances, and all Philoſophers take it for a *Poſtulatum*, *Natura nil agit fruſtra*; if therefore Nature never acts in vain, this Principle can be of no ſmall uſe, ſince it is an Ingredient in all Compoſitions; (Nature being frugal in her Principles, but various in the Effects thence ariſing) and probably it is that univerſal Cement that gives Conſiſtence and Solidity to Bodies, and this we may aſſert as a reaſonable, general, and undeniable Maxim, founded upon Reaſon and the Nature of Things.

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* Vid. Dr. *Woodward* of Vegetation.

† Vid, Sir *Iſaac Newton*'s Opticks, 2d Edition, fol. 350.

The various Degrees of Coheſion in Bodies, is in reſpect of their Figures, but (I think) it does not depend ſolely, upon Particles (or primary Atoms of which Bodies are conſtituted) that are terminated with plain Surfaces, or with curve Surfaces, but muſt have a Cement, beſides that of the univerſal Law of Attraction, (whereby all the Parts of Matter endeavour to embrace one another) for tho' Attraction will bring Bodies to immediate Contact, it will not keep them there, nor hinder them from being ſeparated by any force how ſmall ſoever: Therefore this alone will not do.

But the famous *Bernouli* * endeavours to account for this from the Preſſure of the Atmoſphere, and ſtrengthens his Conjecture by the known Experiment of the Coheſion of two well poliſh'd Marbles together: But how ſatiſfactorily ſoever this may account for the Coheſion or Union of Compoſitions, or greater Collections and Parcels of Matter, yet it is wanting in thoſe minute Contacts of leſſer Bodies, ſome of which were with a Force ſo much greater than the Preſſure of the incumbent Atmoſphere upon them can be imagined to influence; ſo that there is a neceſſity of Recourſe to ſome other Cauſe.

For tho' it be granted that the different Degrees of Coheſion in Bodies, do ariſe from the Diverſities of the Texture and Figure of their conſtituent Parts: Yet all ſuch Mechanical Accounts, however artfully contriv'd, fall ſhort of the full Explication, and no doubt were it not for this acid Principle and Vinculum, Bodies would in a ſhort time diſſolve and liquify, even by the *Liquamen* of the Air, and would ceaſe and diſcontinue to be thoſe Bodies: For, though Attraction unites Bodies, yet it is this Principle that hinders them from being eaſily ſeparated when join'd.

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* Vid. Lib. de Gravitate Ætheris.

There is no Salt in Nature beſides the acid (*omne ſal ex ſe acidum eſt*) out of which all other Salts are made, and the Alcali-ſalt hath no natural Exiſtence in mixt Bodies. However we find an alcaline Salt in Animals, but the Cauſe of it muſt be aſſign'd to Circulation, by which the terreſtrial Matter, Sulphur, and acid Salt, are cloſely united together, and render'd thereby porous, as is done by Fire. For all volatile alcaline Salts are no other than fixt Salts volatiliz'd by the Admixtion of Sulphur.

Let us reflect upon Vegetables, which are the ſupport of Animals, theſe abound with a nitrous eſſential Salt, and this ſame Principle is found in all kinds of Water, (which is the principal Ingredient in all our potable Liquors) and this very ſame Principle is conſtantly ſwimming in our Air (wherein with Breath) which by the Preſence and Action of the Sun, is ſo comminuted and reduc'd into ſuch ſmall Particles, whoſe Points are broke by the force of the Fluid of Light, as to become benign and ſalutary, and not able to do any damage: But in his Abſcence, they ſhoot themſelves into oblong ſharp Wedges, which make the Parts of all Bodies cohere, and fix Fluids in a ſolid Form.

The following Experiment made upon Milk is a pregnant and convincing Evidence, that animal Bodies have this Principle in their Compoſition, and how that theſe latent Acids paſs the Force of the Fire (by Diſtillation) combin'd, and manifeſt themſelves by Putrefaction or Fermentation.

A Portion of ſweet Milk being diſtilled *ad Siccitatem*, and the clear diſtilled Liquor being put to a ſtrong Solution made of common Sublimate in fair Water, it preſently turn'd into a white opacous, and almoſt a milky Liquor. This Solution of Sublimate being diluted with diſtilled Water, will not cauſe a Precipitation, and a falling of white Clouds; an Alcali being neceſſary to produce that Effect. And,

A Portion of Milk, that had ſtood and acquired an Acidity being diſtilled, gave a Liquor very manifeſtly Acid to the Taſte, that it needed no other Trials, as with Alcalies, *&c.* This plainly demonſtrates that the

Acid was latent in the Milk, tho' before Fermentatation the ſaline *Spiculæ* being intimately incorporated with the Sulphur, were rendered ſmooth, *&c.* But when by Fermentation or inteſtine Motion, the Salt had extricated it ſelf from the ramous Parts of the Sulphur, or Oil, then by the inteſtine Colliſion it was converted into a *Vaporoſum*, or a volatile *Gas*.

We find that this Acid, or Nitrous-Eſſential Salt, which is ſo radically implanted in all Bodies, abounds in unripe Fruit, but the Sulphur by the Heat of the Sun being agitated and exalted, they are rendered ſweet. But when the Sulphur evaporates as in Wine or Ale, this acid Salt *de novo* is produced, and the Liquors perverted into a Vinegar.

By all which it is undeniably evident that a *Putredo*, or an inteſtine Motion, reduces all things to their eſſential Parts, or original Principles;

every Part returneth to his Nature or Homogeny; for a Similitude of Subſtance will cauſe a mutual Attraction, and thereby fall into an inteſtine and fermentative Motion, ſo far as to become altered in their Coheſions, and put on new Forms and Diſpoſitions.

By Corruption is meant, ſuch a State of Putrefaction as is acquir'd by Fermentation, which is an eaſy, gentle, ſlow Motion of the inteſtine or inward Particles of a mix'd Body, ariſing uſually from the Operation of active acid Matter, which rarefies, exalts and ſubtilizes the ſoft and ſulphurous Particles, as when Leaven or Yeaſt rarefies, lightens, and ferments Bread or Wort, *&c.*

The following Obſervations ſeem alſo ſufficient to confirm this Doctrine: Malt Liquors when expoſed to the Air turn ſour, Wine becomes roapy and prick'd, Milk and Chyle ſoon acquire an Acidity, as will likewiſe

wiſe the moſt pure elementary Water. Bread grows mouldy and eager, and how ſoon Meal and Water turn ſour and become Leaven.

Do not theſe well-known Circumſtances demonſtrate that theſe have undergone an inteſtine Motion or Putrefaction? Otherwiſe this latent Acid and conſtitutive Principle could not appear as to manifeſt it ſelf to Senſe. Add to this that the Alteration in the Texture of a Subſtance brings a manifeſt Change in the Quality, ſo a Change in the Quality proves an Alteration in the Texture.

To obviate the grand Objection that ſome kinds of Fiſh, Summer-Fruits, and other Subſtances, which ſuddenly putrify in the Stomach and Inteſtines, occaſion Vomitings and *Diarrhœa's*, and the Diſeaſe we call *Cholera*, by acquiring ſuch ſtimulating Qualities, *&c.* For this Reaſon (ſay they) if Digeſtion was perform'd after this Manner, it would always be attended with looſe Stools, and a Train of Miſeries without Number or End.

But that which is brought about in the Stomach, through Indigeſtion or ſuddenly putrifying therein, and goes off with a *Diarrhœa*, &c. is not a ſufficient Reaſon to deny that our Aliment doth not undergo ſome Degree of Fermentation in the Stomach, whereby it is converted into Chyle, and made more ſuitable for thoſe Purpoſes it is farther deſign'd for.

For when the Stomach is overcharged with a Meal, or ſuch things as are too ſtrong for the concoctive Powers, or ſuch as abound with acrimonious pungent Salts, all theſe may cauſe a *Diarrhœa*, or a Vomiting, the former by its oppreſſing Load is diſcharged out of the Stomach, by the diſtending Preſſure being ſo great as to overcome the Reſiſtance of either Orifice; and the Stomach being thus diſtended (and lying contiguous and being partly cover'd by the Liver) it preſſes the Contents of the neighbouring excretory *Ductus's*, namely the Bile in the Gall-Bladder and Liver *Ducts* into the *Inteſtinum Duodenum*, &c. ſo as to irritate and provoke unto Convulſions its internal Membrane, and its muſcular Fibres to contract and draw the Stomach, the *Diaphragm*, and the Muſcles of the *Abdomen* into a Conſent of Co-operating like as in Vomiting.

Thus by the joint Aſſiſtance of the circumambient Parts, with the united Loathſomeneſs, and the *Conatus* or Effort of the Stomach (which is not in an intenſe Degree, as appears by a Fact obvious to the Senſes *) the Aliment is forcibly rejected by the *Oeſophagus*, at which time a Part of the Bile is regurgitated by the *Pylorus* into the Stomach, exciting and repeating the Operation.

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* Mr, *Chirac* having made a ſmall Wound along the Rib that lies overagainſt the Navel of a Dog, who had ſwallowed ſome corroſive Sublimate, and was making moſt vehement Endeavours to vomit; he ſlipt in his Hand thro' the Aperture,

But as to the latter, to wit, thoſe that abound with pungent Salts; they by their *vis Stimulans* produce theſe Effects: But we find by Experience and Obſervation, that the corroborating and reſtringent Bark, *Venice Treacle*, and even *Diaſcordium* if over-doſed, purge and carry all before them. To which may be added the undue Retention of the Aliments in the Stomach and alimentary Channels, *&c.* For,

We muſt allow that Bodies that are inoffenſive and uſeful to the Purpoſes of Life, may be changed into a poiſonous Nature. Witneſs the *Indians*

Aperture, and took hold of the Stomach, and there he found that the Stomach it ſelf felt no Manner of Force or Violence; but that the *Diaphragm*, and the Muſcles of the lower Belly, contracting themſelves both at the ſame time in an Inſtant, with incredible Force ſqueez'd the Hand that held the Stomach. Vid. *Tournfort*'s Preface to his Book of Plants.

Indians who at this Day, the mortaleſt Poiſons that they uſe, have ſome Mixture of Man's Fleſh, and all Fleſh when it is tainted and corrupted to a great Degree is alike venomous and deſtructive to human Nature: Theſe and the like may be apt to lead us into Ideas of a greater Conflict than in Truth there really is: For the Stay the Aliments make in the Stomach, and the Degree of Heat is not able to render the Salts to ſo high a Degree of Volatility, as to put on the Properties of a Poiſon, and act as ſuch.

The Digeſtion of our Aliments in the Stomach, is in a leſſer Degree, and that is only a gentle ſlow Motion of the inteſtine or inward Particles of a mixt Body (eſpecially of their Sulphur and Salt with which Edibles abound) and not by an Over-agitation and fermentative Motion, ſo as to ſeparate the moſt rigid and ſaline Parts from the ſofter and lubicrating bricating Compoſitions with which they were naturally joined, *&c.* The Salts having not totally extricated themſelves from the Embraces of the component Parts; therefore ſafe and benign in the firſt Concoction, and likewiſe ſalutary in the ſubſequent ones.

The preſent Controverſy can be decided only two Ways, either by Authority or Reaſon. I muſt confeſs that my Opinion is not ſo much back'd with Authority as Reaſon is ſupported by Experiments, which plainly demonſtrate that our Aliments in the Stomach are reduced into eſſential Parts or Principles; and that by Fermentation or inteſtine Motion; and that may be as certainly concluded from the following Experiment, as any mathematical Demonſtration concludes its Propoſition.

We took a Dog (after he had been kept from vegetable Food for ſome time) and fed him with Mutton that was boil'd and ſlaughter'd the Day before; and after it had been in his Stomach for the Space of four Hours it was taken from him and put into a Retort, with proper Degrees of Heat, in order to try whether the Aliment would by Digeſtion (or Putrefaction) be ſo opened as that when it is diſtilled, the volatile Salt or Spirit would aſcend before the Phlegm. But upon trial with *Syr. Violarum* found it to be a *Gas* of an acid Nature: This is the *Gas Salium* of *Van Helmont*, which is emitted from all fermenting Liquors, and burning Sulphurs.

The Diſtillation being continued, the volatile-alcaline Spirit aſcended before much Phlegm was come over the Helm. The Experiment being repeated after the ſame Manner, it produced the like Effect: But the Experiment being made upon the animal Subſtance after being boiled only, inſtead of the fugitive acid *Gas* (which firſt comes over) came over a good Quantity of inſipid Phlegm or Water, *&c.*

Therefore this is a Demonſtration, that our Aliments in the Stomach are reduced from their intimate Coheſion and Contact into their Primary State. For no Spirit aſcends by Diſtillation before the Phlegm, unleſs the Texture of the Subſtance be broke by Putrefaction, (or Fire, which in chymical Operations is the primary Diſſolver of Continuity, and thence of ſpecifick Combination) but being thus previouſly diſpoſed, the diſengaged Principles aſcend and elevate ſooner or later in Proportion to their ſpecifick Levity.

And it is manifeſt that the Elevation of Bodies is always proportionable to their different Aptitude to be rarefy'd. The watry Principle or Phlegm, when amaſs'd and conſolidated together in a Concrete, the Globules cohere more laxly than

Salts whoſe plain Surfaces bring many Points into Contact and Union; and thereby have a ſtronger Power of Coheſion than other Bodies which are ſpherical, and therefore are not eaſily ſeparated and diſengaged.

I need not, I preſume, take any Pains to convince the Reader that it is ſufficiently ſhewn and in a very ſtrong Light, that this Ferment or Principle of Fermentation is ſome active inherent Principle in the Aliment it ſelf, and not the ſuppoſed Fermentation from a peculiar Difference in the Nature of two Juices, which conſtitute the *Saliva*, or from the Remains of the Food that was laſt digeſted; and having contracted an Acid or ſome other Quality, as to partake of the Nature of Leaven, or from an Acid which does erode and diſſolve the groſſer Parts of the Food, *&c.* For amongſt the various Fluids and different Secretions in a living Body we don't find an acid Liquor.

Neither is the Diſſolution compleated after it has paſs'd the Stomach into the *Duodenum*, where by the Concourſe of the Bile or Gall, and Pancreatic-Juice (it's thought) a new Fermentation is begun and carried on. But theſe are not the Offices allotted them by Nature, for the Uſe of the former * is to ſeparate and precipitate the Feculencies of the Chyle from the more fluid Parts; and to ſheath or blunt the Acids in their Paſſage. And the latter is to dilute it with the Liquor that is ſeparated in the Glands of the Guts, that it may the more eaſily enter the Mouths of the Lacteal Veſſels.

This muſt be the principal Deſign or End of theſe two Liquors: For however Meat may in the Taſte be ſomewhat ſalt, bitter, *&c.* Yet here is made a Sequeſtration of theſe Qualities, from the Subſtance of the Food,

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* Acor à bile ſana optime ſubigitur, & acidum dulcificat amarum. Helmont. See *River.* p. m. 550. and alſo *Leeuenhoek* upon that Head.

Food, and that only which is ſweet remaineth for Nouriſhment. And tho' it be ting'd of a Violet, Purple, Saffron, Vermilion, or Scarlet-Dye, *&c.* yet it is reduced by Precipitation, to a thin, fluxile, white and oily Liquor, like Milk, *&c.*

I have gone through moſt if not all the Cauſes aſſign'd for the Diſſolution of our Aliments into Chyle, and being all put together are found inſufficient to reduce them into eſſential Parts or Elements, or to cauſe the *Ramenta* or Fragments of Animals and Vegetables to run into thoſe Globules, *&c.*

Therefore it can be no longer diſputed, but that Digeſtion is performed in the Manner here ſet forth: And that a *Putredo* is the *Cauſa ſine qua non,* but it muſt be granted that Maſtication, the *Saliva,* the glandular Juice of the Stomach, the Liquors we drink, included Air, Heat, Contractions and Attritions of the

Stomach, *&c.* are all neceſſary in aſſiſting and diſſolving our Aliments; but that the *Saliva* * ſeems to be the Principal of all the concurrent Cauſes, (excepting that of a Putredo) and that by altering the Property of the *Vinculum* the Bond of Union.

Nothing can be more abſurd than to imagine that a Liquor fill'd with the *Ramenta*, or little Slips or Shreds of carnous and vegetable Fibres, no way differing from the larger (that is indigeſted Pieces of Animals and Vegetables) but in Magnitude, ſhould be ſo uniformly comminuted, as to paſs the inviſible Orifices of the Lacteals, and when it hath overcome that Difficulty and is received within the Limits of Circulation, ſhould be able to circulate through the ſmalleſt Veſſels, and enter the fine perſpiratory Glands, and the laſt Subdiviſions of the Conſtitution.

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* Verum etiam ab ipſa Saliva, vi quadam fermenteſcibili ita imprægnatur, ut vix ampliùs cognoſci, aut à corruptione ſeu aceſcentiâ, *&c.* Waldſ. Oper. Med. Tom. 1. Pag. 13.

And tho' the Chyle (as they ſay) in the Stomach and Inteſtines doth appear by Microſcope to be Part of the Food, divided only into ſimilar or integral Parts, or ſuch as retain the ſame Nature and Properties with the whole not differing from what they were before but in obtaining leſſer Bulks; yet if examined after it has paſs'd the Strainers and where Circulation commences, it is perfectly analagous and conſonant to that of the Blood.

I think that the Aſſertion is made pretty clear already, yet to ſatisfy Doubts, and to cut off all Reply, it is Matter of Fact and Obſervation that the Blood conſiſts of Lymph which is the common Vehicle, and an Infinity of ſmall Globules form'd by the Immiſſion of the Air: But whether theſe are form'd in the Lungs by the ſubtile elaſtick *Aura*, paſſing through the Sides of the Blood-Veſſels, or form'd from the viſcid Part of the Chyle, before it is admitted to circulate by the Force of the ſame ſubtile Fluid, is Matter of Speculation.

But it is highly probable, that they are little Bubbles blown from the viſcid Part of the Chyle, by the Force of the ſame elaſtick Air, and that they are form'd before they arrive at the Lungs, where they may be re-form'd whenever theſe Bubbles happen to burſt.

We have already ſhewn, that Chylification is a Diſſolution of our Aliments into eſſential Parts, and not a Comminution into ſimilar or integral Parts, or ſuch as retain the ſame Nature with the whole; but by an inteſtine Motion are reduced into a Fluor fit to paſs the Strainers into the Lacteals, and from thence, by ways ſufficiently known, admitted to the Blood in the *Subclavian Vein, &c.* in order to be tranſmuted into it.

Of Chyle Blood is afterwards compoſed, and in Women that give ſuck, the Milk * more immediately. For when either Chyle or Milk are examined by the Microſcope, they appear like Blood to conſiſt of ſmall Globules ſwimming in a limpid Fluid.

By Sanguification is generally underſtood the Aſſimilation of Chyle into Blood, which is performed by the Attrition of the Arteries thereupon, and by the ſeveral Motions, as well inteſtine as progreſſive, there is made ſuch an intimate Mixture of Parts, which is ſuppoſed to be compleat, when the whole circulating Maſs is ſaturated with a high red Colour, and upon *Phlebotomy* ſeparates in the Baſon into two different Parts, a red *Craſſamentum* and an amber-colour'd *Serum* only, without any white Matter floating looſe on the

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* Quod Lac non fiat ex Sanguine, ſed ex Chylo, Vid. Petr. Guiffart. Exercit. Med. De proxima Lactis materia.

Vid. Lower. De Sanguinis Motu & Calore.

Surface, as Chyle before perfect Aſſimilation will do.

When the Blood is thus conſtituted, we find by the Chymical Analyſis of it, Oil, Water, Salt, and Earth, which are the conſtituent Principles of Animals and Vegetables (which are very agreeable unto Aſſimilation, and containing approximate Diſpoſition unto Animation, as conſiſting of the ſame Principles) and are ſo well known as to their juſt Proportions, that they need not be here mentioned.

The fifth Principle, which is the Spirit, ought to be left out of the Number, and they reduced to four, unleſs we adopt that of the Air, which is a very active one, and is wrought more or leſs into the Compoſition of all natural Bodies.

For neither the animal, vegetable, nor mineral Kingdom can be properly ſaid to have an innate Spirit, becauſe

cauſe they are produced by Diſtillation or Fermentation. The ardent Spirit is Water impregnated with Sulphur: And the urinous Spirit is the ſame Element impregnated with Salt: Conſequently neither of them can be number'd among the connate eſſential Principles, as being primarily ſo; they being two Principles united.

The ſaline Particles that are taken with our neceſſary Nouriſhment are the Original and Conſervation of the Volatile; for the ſubtile Sulphur or Oil penetrating into the Pores of the fixt Salt, cloſely knits it ſelf with its Particles, and being of a ſubliming Nature, that is derived from the igneous Minims it contains, doth levitate, ſublime, and volatilize the ſaid Salt.

Thus the ſaline and the oleous, or humid Subſtance, are rendered an Ætherial Fluid, and when thus confected and under this Modification (it's thought) it becomes what animates thoſe minute Threads or Fibres, and that they owe to it their Elaſticity and motive Faculties, however convey'd, or through what Paſſages deſtined for that Purpoſe.

The animal Spirits are defined to be a very thin Liquor, which diſtilling from the Blood in the outward and cortical Subſtance of the Brain, and thence through the medullar Subſtance of the Brain, the *Corpus Calloſum*, and *Medulla oblongata*, thus it is carried through that intricate Secretion into the Nerves, and thence derived into the Body of the Muſcles, to occaſion an Inflation and Contraction in ſuch Parts, by rarefying the Blood to expand it ſelf. And that, by virtue of this ſame Fluid, are perform'd all the Actions of Senſe and Motion.

There is nothing in Nature that can be ſuppoſed to bear a greater Similitude to the animal Spirits, than vinous or ardent Spirits *, for the immediate Effect that ſpiritous Liquors have upon the Nerves by adding to their Springineſs and Force of the Fibres, is a very great Reaſon of the near Cognation between the Fluids. And moreover, dephlegmated Spirit of Human Blood (which is an urinous one) being ſhaken and thereby confounded with the ſame Quantity of Spirit of Wine, it will permanently unite, notwithſtanding that theſe two Liquors do belong even to differing Kingdoms, the one to the Animal and the other to the Vegetable.

The Difficulty ariſes hence, that the Heat in animal Bodies is not ſufficient to ſubtilize and raiſe a Spirit, ſuch as is produced by Diſtillation, by the Help of a Fire. And becauſe we

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* Vinum eſt adeò ſpirituoſum, ut ad Spirituum Animalium naturam quàm proximè accedat. Malbran. de inquirend. verit. pag. 82.

Sp. Vini eas in ſe continet particulas, quæ in ſpiritus animales facilè migrare poſſunt, &c. Friend's Emmenolog pag. 164.

we cannot obtain from human Blood an ardent Spirit, which is the uſual Product of Fermentation in Liquors, yet it is a combuſtible Body; but every one will not think it ſo inflameable, as the indefatigable Mr. * *Boyle*, upon Trial purpoſely, found it to be.

All ſulphurous Bodies have their igneous Quality from the Acidity and corroſive Salts, as *Phoſphorus* the moſt igneous, being only Sulphur and Salt in a *Coagulum*, which differs but in Reſt, or in a leſſer Degree of Motion from actual Fire; for it doth continually emanate by Irradiation, or atomical Effluviums. And this being the Product of Urine, ſurely it muſt be true, and beyond Contradiction that theſe Principles were pre-exiſtent in the Blood.

The ingenious Mr. *Godfrey*, who has brought *Phoſphorus* to ſo great a Perfection; can by his extenſive

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* Nat. Hiſt. Page 31, 32, 33.

Reach of Chymiſtry, make vinous or ardent Spirits, which are liquid Sulphur, ſuch a *Materia Subtilis* (and not altogether by Diſtillation) that a a Drop will not fall to the Ground, but will immediately be diffus'd in the Air.

Whether Nature in her moſt ſecret Elaborations takes ſuch a peculiar Mixture and Method to ſubtilize ſome of the various *Aporhœa* of the Body, or whether it be by Attrition and frequent Occurſions, or both, is not at all material, ſince it is matter of Fact that animal Bodies do very much comminute and ſubtilize, *viz.* in ſenſible Perſpiration, and the volatile Salts that animal Subſtances plentifully yield by Diſtillation: And that inſomuch that no fixt Salt can be abſtracted from them, becauſe all the ſaline Parts are ſo volatile, that (to ſpeak conſonantly to the Chymical Dialect) they cannot ſuſtain a Colliquation with the earthy Parts, eſpecially ſince there are few, if any, manifeſtly acid ones to concur to their Fixation.

After we have canvas'd the Probability of the Exiſtence of ſuch a ſubtile Fluid, as the ſuppoſed animal Spirits, it will be requiſite that we enquire into the Structure and Make of the Nerves, which are the Conduits that convey this Fluid.

Riolanus, *Gliſſon*, and others (copying after them) teach, that the Nerves are very fine Pipes or hollow Fibres: But *Veſalius*, *Aquapendente*, and *Leevenhoek* the moſt accurate Anatomiſt, deny that they have any manner of Cavity.

Therefore ſeeing Senſe hath not diſcovered any ſuch, by means whereof the vivifying Juice, or ſubtile Fluid may be propagated; 'tis probable that there are to be admitted only little Pores, and Interſtices in the medullar Subſtance, whereby they receive Nutrition, *&c.*

But the incomparable and indefatigable Searcher into Nature, Sir *Iſaac Newton,* doth propoſe as a Query, in his ſecond Edition of his *Opticks,* Page 328. " *Queſt.* 23. Is not Viſion " perform'd by the Vibrations of " this Medium, excited in the bot- " tom of the Eye by the Rays of " Light, and propagated through " the ſolid, pellucid and uniform " *Capillamenta* of the Optick Nerves " to the Place of Senſation? And is " not Hearing perform'd by the Vi- " brations either of this or ſome " other Medium, excited in the au- " ditory Nerves by the Tremors of " the Air, and propagated through " the ſolid, pellucid and uniform " *Capillamenta* of thoſe Nerves into " the Place of Senſation? And ſo of " the other Senſes".

" *Queſt.* 24. Is not animal Motion " perform'd by the Vibrations of " this Medium, excited in the Brain " by the Power of the Will, and

“ propagated from thence through
“ the ſolid, pellucid and uniform
“ *Capillamenta* of the Nerves into
“ the Muſcles, for contracting and
“ dilating them? I ſuppoſe that the
“ *Capillamenta* of the Nerves are each
“ of them ſolid and uniform, that the
“ vibrating Motion of the Ætherial
“ Medium may be propagated along
“ them from one to the other uni-
“ formly and without Interruption”.

Theſe are the Propoſitions of that great Man, who has ſo well contemplated the Powers of Nature, the Properties of natural Bodies, and their mutual Action one upon another.

When all this is premis'd, to wit, the Uncertainty of ſuch a ſubtile Fluid, the Texture of the Nerves, and that all the Secretions perform'd within the Body are conſpicuous, excepting that alone, which is made at the Origin of Nerves; it may afford us ſufficient Reaſon to ſuſpect the received Opinion, and what before was determined, and may make it reaſonable to depart from that Determination, and give our ſelves up to be determined by others, eſpecially by thoſe of more ſerene Capacity, rather than fall into Scepticiſm.

And to refuſe ſuch Compliance to what ſeems ſo plauſible, founded on experimental Obſervations, and demonſtrable Principles, the ſole Original and Fundamental of true Knowledge, (which our Senſes are Witneſſes to) manifeſtly betrays our own Self-conceit.

And though we have not been able to diſcover the Nature, and ſenſible Qualities of the animal Spirits, yet they are thought to be real; becauſe they cannot account for Muſcular Motion, without the Co-operation of the Blood and nervous Fluid, to diſtend the Veſicles or Cavities of the Fibres, *&c.*

But if we have no other Reaſon to ſupport our Belief, I take it to be very implicite if the following Rationale doth not ſhake the Foundation and cauſe it to ſeem paradoxical. For,

It has been demonſtrated by Experiments, that the Muſcles in Contraction ſink into their own Subſtance, therefore makes void the Neceſſity of the Blood and animal Spirits to co-operate in the Contraction, Swelling, or Motion of the Muſcles. And moreover what need is there of the immediate Reciprocation or Recurſion of the nervous Fluid, to propagate, if the ſolid, pellucid, and uniform *Capillamenta* of the Nerves, are endu'd with that Power of contracting and relaxing the whole Animal Syſtem. And we can have no ſtronger Demonſtrations of this, than our inward Perceptions, the inſtantaneous Motions of the Fibres on the Mind's Direction, and the contracting and relaxing of them *ad Libitum.*

Hence it is undeniably evident, that, if the caſe ſtands thus, there is no neceſſity the animal Spirits ſhould flow into the Muſcles, to cauſe them to move, by conveying into them that Virtue they are already poſſeſs'd of, by Mediation of the nervous Syſtem. And,

If we allow of animal Spirits, this Queſtion will ariſe: How comes it to paſs, that that *Halitus* is not equally diffus'd, and not to one Place rather than another? For, as in Springs, the Impetuoſity of the Water is equally communicated to all the Channels or Rivulets, and not to one rather than another, if they be equally open; (*qua data porta ruit*) ſo can it not be conceiv'd, if Motion is the Reſult of the Spirits flowing into the Nerves, but that all the Body muſt equally receive the ſame Impreſſion, ſince the nervous Syſtem, through which they are to flow, are all equally open.

In fine, it is generally acknowledg'd by the major Part of the Faculty, that the vital, ſenſitive, and motive Faculties are convey'd to the Parts by the Spirits. But they do not make out the main Difficulty, that is, of what Nature and Quality they are of, and that Life, which ought to be common to all Parts, cannot be found in thoſe that are ſeparated from the whole; and that the Spirits are of that Rank, as having not any Union or Continuity with the ſolid Parts.

If involuntary Motion, as that of the Heart (which is not under the Power of the Will) doth not intirely depend upon the Influx of animal Spirits, but is perform'd by the Aſſiſtance of an extrinſick Agent: And if this *Automaton*'s perpetual Motion is carried on by vertue of this extrinſick Agent, to wit, the Atmoſphere, (as is evidently prov'd from the *Torricellian* Experiments, and thoſe made upon Animals in Mr. *Boyle*'s Engine:) we need not be perplex'd to find out the Cauſe of voluntary Motion.

For it may be propagated along the ſolid Fibres; theſe receiving the impreſs'd Motion and Direction of the Soul, invite and excite the Courſe of the Blood to all thoſe Places, which they have Orders to convey it to. But ſome may ſay, that nothing can be produced without a Cauſe; therefore it is neceſſary there ſhould be ſome Cauſe to determine the Will. This Objection is readily anſwered. The Will determines it ſelf: It chooſes becauſe it wills; it is it ſelf the Cauſe of its Determination.

And it is not to be doubted, but that an OEconomy ſo juſt, and ſo regular in the Variety of its Operations, is guided and govern'd by ſome Power which hath a Preheminence above the elementary Virtues, and participates of that ſecret Intelligence, which the Author of Nature hath been pleaſed to entruſt the Soul withal, for the Conſervation of the Animal.

But whether the Nerves are pervious, or whether there be any ſuch thing as animal Spirits *, is not to my preſent Deſign: Yet ſince I treat of the Blood (that is the Fluid in the Veins and Arteries) which is the common Promptuary of all the other animal Fluids, becauſe they are all Parts of the Blood variouſly combined and ſeparated from it by the Force of the Heart, and many of them by the ſame Force return to it again: And tho' my Deſign is not to treat of all the animal Fluids, yet cannot paſs this by without Regard, it being ſuppoſed to be the Principal of Vitality, and chief Inſtrument of animal Actions.

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* Vid. Diſquiſition Phyſiolog. Patholog. Andr. Ottom. Goelicke, Med. Profeſs. atq; Phyſico Provinciali Regio.

This Phænomenon will be ſet in a clearer Light by the following Obſervation, *viz.* when a Nerve is deprived of its Elaſticity, either by an Obſciſſion, Contuſion, or Preſſure of the ambient Veſſels, there is an entire Loſs of voluntary Motion or Senſe, or both in the Part, and attended with an Atrophy. Therefore the Nerves are the Inſtruments of Senſe and Motion, however or after what Manner they communicate that impreſs'd Motion to all the Parts of the Body.

But if we conſider that the whole Machine is a Compoſition of thoſe minute Threads or Fibres, variouſly interwoven, and correſponding to one another, it will appear very probable that they may inſtantaneouſly convey their Impreſſions in contrary Directions, rather than propagated by the Undulation of a Fluid: And it ſeemeth rational to conclude, that Senſe and Motion are performed by the Action of an extrinſick Principle on ſolid Fibres: For in all Motion there is always ſome foreign impelling Power; and when Emeticks or Opiates (which cauſe different Senſations) are taken into the Stomach, they no ſooner act upon the nervous Fibres, but they tranſmit to the Brain ſuch Motions as they receive: The Reſult of which is what we call Senſe.

Hence we may gather, that whether it be an extrinſick Principle, or whether it it be a Fluid that is mitiated *pro re natâ*, or according to the *Imperium Voluntatis*, (I ſhall here make uſe of the ingenious and learned * Doctor's own Words) "It is requi-"ſite to maintain the Elaſticity of "the Nerves that there ſhould be "ſent Nouriſhment duly concocted, "and ſufficiently ſubtilized (ſo as "it may readily quite paſs through "all thoſe ſmall winding Channels

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* Dr. *Cheyne*'s Eſſay on the Gout.

" to the laſt ſolid Fibres) to fill " their empty Pores, to ſwell their " Bulks, and thereby to leſſen their " Length, *i. e.* to ſtretch or wind " them up."

So that the Nerves receive their Nutrition and Supply by Accretion, which is nearly of the ſame Senſe with Augmentation, and is properly an Addition of Matter to any Body externally: I ſhall dwell no longer upon the nervous Subject, but keep to my main Deſign, *viz.* Tranſmutation of Blood, *&c.*

Having already given an Account of the Compoſition and the immediate Matter of the Blood, and how it is aſſimilated, I ſhall endeavour to ſhew how the Blood changes into *Pus:* Tho' at this time it is a prevailing Opinion, and ſeems to be daily more and more confirm'd, that the Blood alone cannot ſuppurate and be changed into Matter; and this I ſhall ſupport by the following Arguments.

It is moſt likely from the Diſſolution of the Sulphur, that the red Colour or Tincture of the Blood doth ariſe: For ſulphurous Bodies, befor any others, impart to the ſolvent *Menſtruum*, a Colour highly full of Redneſs: So that the whitiſh colour'd Matter contained in Pimples, Wounds and Abſceſſes, proceeds only from the latent Acid that precipitates the Sulphur of the Blood, and changes its red Colour into a whitiſh one.

The red Colour of the Blood proceeding from the Reſolution of the ſulphurous acid Parts being ſet at Liberty, as that they may mix *per minima*, and make a ſubtile Effervesſence with the ſubtile Alcali, is at length ſo reſolved as to manifeſt it ſelf by tinging the whole Liquor: After the ſame Manner, in the Tincture of Salt of *Tartar*, the Spirit of Wine (which is a liquid Sulphur) is ting'd by the volatiliz'd Alcali of the *Tartar*.

And we find that common Sulphur boil'd in the *Lixivium* of any fix'd Salt, is thereby exalted to a red Colour; but becauſe the Alcaline is ſo ty'd to the terreſtrial Particles that it cannot penetrate the Sulphur *per minima*, therefore the Colour is obſcure and dark. Now if you pour another acid Liquor upon theſe ſanguine Tinctures, immediately they become of a milk-white Colour (and this anſwers in natural * as well as artificial Tinctures) juſt ſo it happens when the Blood is ſtagnated or extravaſated and putrefied in any Part of the Body.

The Operation of *Lac Sulphuris* may give us an Idea of Chylification, Sanguification and Putrefaction. For as Sulphur becomes white in the Majiſtery, ſo Aliment being attenuated and diſſolved into our Stomachs is in Part reduced in a Chyle of a white Colour; and as the Sulphur when entirely diſſolved turns of a red Colour, ſo the Parts of the Chyle being exalted and diſſolved by repeated Circulations become red and converted into Blood; which Blood in Apoſtemes, turning into *Pus*, becomes white again by reaſon of the Acid aſſiſting anew in that Operation.

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* Vinum rubrum infuſo Sp. Vitrioli momento albeſcit. Arc. Moſ. G. Horn. pag. 205.

For Proof of this Aſſertion, 'tis to be noted, that to all Bodies there concurs an Acid as a conſtitutive Principle or *Vinculum*, whereby the Alcali is bound into a Body; for there is no Alcali, but in its intime and centrical Particles contains a moſt acid, corroding, and perforating Salt, therefore cannot be denied to the Blood.

So that *Pus* is nothing but Blood ſtagnated and void of Motion, thereby every Principle begins to diſengage, and produce Corpuſcles *de Novo*, of different Figures, Gravities, and Diſpoſitions, from what before exiſted therein; (becauſe that by circulating Motion it was kept in that union Form) and acquiring an Acidity, for nothing which is continually moved grows ſour, but ſuch things only which upon Ceſſation of Motion ſtagnate or adhere.

And the Acidity that ariſes from the Putrefaction precipitates the Sulphur that ting'd the Blood, and thereby introduces that Change which is called Corruption: And this is done by deſtroying the Texture and Continuity, or ſpecifick Degree of Coheſion. For the different Forms of Bodies are nothing but the different Modification of the ſame Matter; and depend upon the various Magnitude, Figure, Texture, Poſition, and other Modes of Particles compoſing Bodies.

Thus the divine *Hippocrates,* who with the greateſt Diligence and Induſtry obſerved the moſt minute Circumſtances of Diſeaſes. *Si in ventrem*

trem ſanguis præter naturam effuſus fuerit, eum ſuppurari eſt neceſſe. If Blood contrary to Nature flow into any Cavity, it corrupts and ſuppurates of neceſſity; which makes it plain that tho' the Blood be of an adequate Mixture, it is liable to this Change if extravaſated or out of the Force of Circulation.

Dr. *Liſter*'s Comment upon the ſame Aphoriſm of *Hippocrates*, is as followeth, *viz. Verùm in duplicatura peritonæi in aſcitide ad centum & amplius libras incorruptus effuſus eſt, & feliciter paracentheſi evacuatus. Vide Exercitationem noſtram de Hydrope, alterâ impreſſione. Imò è vulnere imi ventris poſt menſem ſanato, ſubitas dejectiones non ſine animi deliquio, ad plures libras ſanguinis atri, & in pus nondum converſi, corrupti tamen & fœtidiſſimi, ipſe vidi: tamen ab iis dejectionibus optimè convaluit juvenis ſauciatus. Igitur hic ſuppuratio latiùs ſumenda eſt, pro omni ſtatu ſanguinis extravaſati.*

To make good this Aſſertion here, in order to refel the Aſſertion of that divine Author, were very unreaſonable, ſince to do it exactly, (and without Exactneſs, it were no Demonſtration) requireth a total Survey of Circumſtances, *viz.* Whether the extravaſated *Serum* or *Craſſamentum* were not deſtitute of proper Heat in proportion to the Quantity extravaſated, and how long detained, *&c.* And this with all the Succinctneſs we are able to explicate ſo knotty a Subject.

The famous Lithotomiſt Dr. *Cyprianus,* in his Epiſtle to Sir *Thomas Millington de Fœtu,* &c. endeavours likewiſe to make it appear that the Blood alone never mutates into *Pus*: And this he ſupports and ſtrenuouſly maintains from Facts and Experience; but without doubt his Obſervations were not juſt and accurately taken, otherwiſe he might have found, that either the *Craſſamentum* or *Serum* would mutate into *Pus*, without the Aſſiſtance of another Humour.

I ſhall not inſert all his Obſervations, as being too tedious, and becauſe he ſums up the whole Matter as followeth, *viz. Pour donc qu'il ſe forme du pus, il eſt néceſſaire qu'il s'extravaſe des humeurs, de diverſe nature; qu'elle ſe mélant, & ſe fermentant quelque peu enſemble de la vient que ſelon la diverſitè du mélange & des humeurs, il ſe forme diverſes ſortes du pus. S'il ſe ramaſſe des humeurs lymphatiques de diverſe nature hors des vaiſſeaux, & qu'elles ſe mélent, s'agriſent & fermentent enſemble, il ſe forme un pus ichoreux: Si le ſang eſt mélé avec une autre humeur, on le apelle un pus ſanious; mais pour qu'il ſe faſſe un pus bon & loüable, il faut qu'il ſe faſſe un mélangede la lymphe avec la graiſſe: Si ces deux humeurs viennent à s'extravaſer & a ſe méler dans une certain proportion, il ſe forme le plus ſouvent des abſcez.*

On remarque auſſi qui les parties qui abondent en ces humeurs ſont plus ſujettes à des abſcez; ce qui ſe voit tous les jours dans les mammelles des femmes; car comme ces parties abondent en ces deux humeurs dont nous venons de parler qui ſont néceſſaires pour le generation du lait, elles ſont auſſi ſouvent attaquées d'abſcez. C'eſt pour la même raiſon que les interſtices des muſcles ſont les ſieges ordinaires des abſcez, &c.

Au contraire les parties qui n'abondent pas en ces humeurs, ſçavoir en lymphe & en graiſſe, ne ſont jamais ſujetes au abſcez; tel eſt le corps charneux du muſcle qu'on n'a jamais veu attaqué d'abſcez ou plein du pus.

“ Hence it's neceſſary that there
“ ſhould be extravaſated Humours
“ of diverſe Nature that they may
“ be mixed and fermented together;
“ whence proceeds that according
“ to the Difference of Mixture and
“ Humours they form different ſort
“ of Matter. If lymphatick Hu-

" mours of diverſe Nature be extravaſated, and if they mix, grow " ſour, and ferment together, they " form an ichorous Matter: If the " Blood is mixed with any other " Humour, 'tis called a ſanious Matter; but when it forms a good " and laudable Matter, it muſt " make a Mixture of the Lymph " with Fatneſs; if theſe two Humours happen to be mixed in " any certain Proportion, it is " formed generally into an Abſceſs."

" 'Tis obſerved alſo that the Parts " which abound in theſe Humours " are moſt ſubject to Abſceſſes, " which is ſeen every Day in Womens Breaſts; for as the Parts abound in theſe two Humours, " whereof we are to treat, which are " neceſſary for the Generation of " Milk, they are often attack'd with " Abſceſſes. 'Tis for the ſame Reaſon " that the Interſtices of the Muſcles are " the common Seats of Abſceſſes, *&c.*"

“ On the contrary, thoſe Parts
“ which don't abound with theſe
“ Humours, that is Lymph and Fat-
“ neſs, they are never ſubject to
“ Abſceſſes: Such is the fleſhy Part
“ of a Muſcle which is never attack'd
“ with Abſceſſes or full of Matter. ”

In anſwer to his Obſervations we rather find the contrary, for Womens Breaſts are compoſed of a great Number of Glands, and conſequently ſeldom ſuppurate and become Abſceſſes; and it is obvious and paſt all doubt, that the Subſtances of the Muſcles, or Fleſh, are the moſt proper Parts for generating, and better for forming *Pus*: Since *Pus* is nothing elſe than the Blood ſtagnated and turned to this Appearance; and different ſorts of *Pus* are occaſioned by the different Condition of the Blood, and the various Degrees of Heat in the Part.

We don't only find *Pus* among the Membranes and Interſtices of the Muſcles, for ſometimes the whole Subſtance of the Muſcles is gone, and at other times ſo as to diſcover a Sight as pleaſant as ſtrange, *viz.* the Veins, Arteries, Nerves, and Tendons, and in ſhort all the large Veſſels, where the Blood circulates, bare and untouched; but upon the Patient's Recovery all fills up as before with new Fleſh.

And moreover we may ſenſibly obſerve in the very Part, that it gradually acquires new Qualities, it being at firſt red, and if wounded then diſtills Blood, which by lodging in the Part inſenſibly ſuppurates, and becomes what we call *Pus*; by which it is plain, it there aſſumes new Qualities that juſtly entitle it to new Denominations: So that we may conclude that thoſe Parts which don't abound with theſe Humours, that is, Lymph and Fatneſs, ſuch is the fleſhy Part of a Muſcle, is the moſt proper Part, and moſt ſubject to Abſceſſes.

He elſewhere delivers it as a ſtanding Maxim, that a *Ganglion* and *Ranula* never change into a purulent Matter, though they ſhould remain extravaſated a whole Year or more. And other Extravaſations of Lymph, which never ſuppurate, *viz. Artheroma*, *Steatoma*, *Meliceris*, &c. I muſt own that theſe are ſcarce ever cured, but by a manual Operation.

There is lately publiſhed, " an " Eſſay of Phyſick * and Surgery, " containing an Examination of the " main Circumſtances of Suppura- " tion in the ſoft Parts, by *Antony* " *Fizes.* M. D. *&c. Montpellier.* " Wherein the Author explains the " Cauſes of Suppuration, how it is " performed, and the Accidents that " precede, attend and follow it: " And reduces the vaſt Number of " Cauſes enumerated, to three ge- " neral ones, *viz.* 1. The Weak- " neſs

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[*] See New Memoirs of Literature. vol. 1. pag. 108.

" neſs of Vibration of the entire
" Veſſels. 2. The too great Re-
" ſiſtance of the wounded Veſſels;
" the Want of thoſe Humours
" which muſt form the *Pus.*" And,

" In the Problem, which makes
" the ſecond Part of the Work, the
" Author undertakes to explain the
" Differences obſervable in the Be-
" ginning and Progreſs of the Sup-
" puration. In order to avoid a
" confuſed Detail, he reduces them
" all into five principal Heads, *viz.*
" 1 The nature of the Parts different-
" ly conſtituted. 2. The bad Qua-
" lities of the Humours, which com-
" poſe the Maſs of Blood. 3. The
" particular Imperfections of the
" Fluids and Solids in the very
" place of the Wound. 4. The
" Manner how the Wound was
" made. 5. The Methods that have
" been practiſed for the Cure of it."

" From whence one may con-
" clude (as our Author does) that
" the

" the *Pus* will have different Im-
" perfections, analagous to the diffe-
" rent Characters of the bad Juices,
" or the different Degrees of De-
" pravation, occaſioned by theſe
" Juices in the animal OEconomy."

" And as to the different Conſti-
" tution of the Parts, there being
" none that contain more Blood
" and Lympha than the Muſcles, it
" follows that the Suppuration will
" be performed in them more eaſily
" and plentifully than any where
" elſe. By the contrary Reaſon, it
" is very ſmall in thoſe Parts that
" have many Nerves, Tendons,
" Ligaments and Membranes: And,

" A very ſlow Suppuration muſt
" be expected in the Fat and the
" Glands. The Reaſon alledged
" by the Author, appears undenia-
" ble; 'tis the Slowneſs of the Cir-
" culation in thoſe Places: For the
" Veſſels of the Fat are looſe, flaggy,
" and of a ſpongious Contexture:

" And the Glands of interwoven " Veſſels, whoſe Foldings and Circumvolutions are as many Obſtacles to progreſſive Motion. This is " ſufficient to occaſion Obſtructions, " which commonly produce either " a Mortification, or *Scirrhus Tumors.*"

They that would be better acquainted with theſe Diſſertations of Dr. *Fizes*, I muſt refer them to the *New Memoirs of Literature*, taken from the Journal *des Sçavans*, or to the Book it ſelf.

Dr. *White* in his Book of Fevers, tells us, " That moſt of the Antients " were of Opinion, that ſome of " the Humours of the Blood were " really capable of Putrefaction: " That *Galen* compareth the Putrefaction within the Veins to that " which is made in Abſceſſes from " the Humours: That *Heurnius* " diſtinguiſheth Putrefaction of human Bodies into that which is

“ made of Blood, which is *pus purum,*
“ and that which is made of *Serum*
“ or *Ichor,* and this he calls *materia*
“ *purulenta.* And that *Fernelius* *
“ aſſerts that ſome Parts of the Blood
“ are capable of Putrefaction, and
“ others not; and herein he only
“ erreth, for he gives an elegant
“ Deſcription how the putrefiable
“ Parts in Fevers attract one another,
“ till at laſt all thoſe Particles
“ capable of Putrefaction are putrefy'd,
“ and then that which is pure
“ is ſeparated from them all together.”

It is certain, undeniable, and true, that moſt of the Antients were of Opinion, that ſome of the Humours were really capable of Putrefaction; and that theſe appear in the Urine of Perſons in a Criſis, and paſs off by Urine, Stool, Perſpiration or Sputation (*Ablata materia peccante*) and thereby put a Period to the Diſeaſe.

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* Lib. 4. Pathol. Cap. 6.

That incomparable Phyſician *Galen's* Opinion (who may deſervedly be held to have compleated the Art, by introducing and eſtabliſhing the Theoretick or Speculative Part) is very agreeable to this Aphoriſm; for he aſſigns no other Cauſe than Stagnation. And this will appear to any one, that it proceeds from no other Cauſe than Stagnation, in or out of the Veſſels: So that Stagnation or the Cauſes of Stagnation muſt be the Origin.

Heurnius has well diſtinguiſh'd what was confus'd, to wit, between the Putrefaction of the grumous Part of the Blood, and that which is made of *Serum* or *Ichor*.

But as to *Fernelius*'s Opinion concerning Putrefaction in Fevers, it is no more than what moſt of the Antients concurr'd in, and that is, that the Putridneſs doth not ſeize and invade the Blood all alike: (*Sed ejus pars alia citius alia tardius & putreſcit*

putreſcit & ſuppurat, &c.) Becauſe they would have it, that the Blood is not altogether ſimple, but compoſed of a Mixture of many Humours, it begins with that Part of it as is moſt obnoxious to Putrefaction, and from thence on ſome other Part mixt therewith, leſs vicious than it ſelf; and in this Manner advancing on by Degrees, 'till all thoſe Particles of the Blood, that were liable to Putrefaction are conſumed; which being done the Fever ceaſes, *&c.*

I have this for my Satisfaction, that I have *Hippocrates* and *Galen* both to aſſiſt me, and to ſupport my Reputation; and this ſeems to give a Sanction to it. For all of this kind (to wit, *Hippocrates*'s Aphoriſms) that are borrowed from the Antients are good, though they are not begotten in the latter Centuries, but old and obſolete, yet will always ſtand the Teſt: For Nature being ſtill the ſame, it is impoſſible for any modern Writer to paint her otherwiſe than the Antients have done; theirs being the Product of a juſt and ſolid Obſervation. So that this whole Doctrine appears to me highly confirm'd by ſo great an Authority, that there will be no room left to doubt.

I ſhall here tranſcribe the whole that relates to the *Tranſmutation of Blood*, that I may compare the Doctor's Sentiments with the antient Authors which he has quoted; and from thence demonſtrate what little Reaſon appears in the whole to diſſent from the inviolable Maxims of *Hippocrates*.

To proceed then, the Dr. is of Opinion, " That neither arterial nor " venal Blood is capable of Putre-" faction, or Digeſtion into *Pus*; I " can aſſert from Inciſions made in " many Parts of the Body, where " there was time enough for that work " to have been done; and all Men who

“ have been Practitioners of Chirurgery will affirm the ſame. Next, “ where-ever we find *Pus*, it is “ among the Membranes, whether “ in the Interſtices of the Muſcles, “ or in thoſe of the *Cutis Vera*, as “ we ſee in *Exanthemata* of the “ diſtinct ſmall Pox, and the Abſceſſes called *furunculi*, *paronychia*, &c.”

To this I anſwer, that inciſions may be made in ſeveral Parts of the Body with a ſharp Inſtrument, and the ſame cicatriz'd by keeping the Lips of the Wound together with a good Bandage only, without any Appearance of *Pus*. But whether he or any other can ſay the ſame of Wounds made by Contuſion, Laceration, and Loſs of Subſtance, or even that made with a ſharp Inſtrument, if dreſs'd with a drawing Plaiſter, or an unctuous Balſam?

This I ſhall readily appeal to all Practitioners of Surgery; eſpecially if in the fleſhy Part, or the Body of a Muſcle: And ſhall likewiſe appeal the latter Part of the Story, if they don't find *Pus*, as frequent in the muſcular Parts, as they do in the Interſtices of the Muſcles: And that, if an Inciſion be made in one of the *Puſtulæ* as ſoon as they are form'd, or in the Abſceſſes mentioned (as they are very often oblig'd to do, becauſe it is apt to make the Bone carious) thence will flow only Blood.

Therefore it is that rubicund Liquor (wherewith the muſcular Parts do moſt abound) that is converted into *Pus*; whether extravaſated into the Interſtices of the Muſcles, or thoſe of the *Cutis Vera*.

“ Again (ſays he) I have obſerv'd
“ many times where the wounded
“ have been (which is frequent a-
“ mong Soldiers) twenty four Hours,
“ or ſometimes thirty without Vic-
“ tuals, marching it may be twelve
“ at that time; yet when the Wound

" came to be dreſs'd, there ſcarcely
" appear'd any true *Pus* on the dreſſing, yea, it was mixed with much
" Blood; and the very next dreſſing
" we ſhould find good Digeſtion,
" when the dreſſing was done within the time of *Chylification.* Moreover in large Abſceſſes between
" the Muſcles, we ſee both the Veins
" and Arteries lie untouch'd, tho'
" the *Pus* be form'd round about
" them ".

As to the Doctor's Obſervation and Rationale, that the *Pus* was not true, is plain and eaſily anſwer'd. And that is, the Blood being put into a greater Motion by their marching, whereby it made way through the Mouths of the lacerated Veſſels; and ſome of it having not ſufficient time to ſuppurate and to be form'd into *Pus*; conſequently a partial Concoction. And his finding good Digeſtion within the time of *Chylification,* muſt be owing to Reſt, and to the Blood being not violently forc'd out of the Extremities of the Veſſels, and not to the Chyle.

This Notion probably was borrowed from *Waldſchmidt* *, *Verùm obſervare te velim, Pus primis diebus non prodire, nec Chylum à ſanguine ſecerni poſſe, &c.* Notwithſtanding the Authority of this worthy Author, let us ſuppoſe, for inſtance, a Patient for ſeveral Days, by reaſon of a dejected Appetite, or for want of Victuals (as in the afore-mentioned Caſe) aſſumes no Nutriment; whence muſt this conſtant Supply of Chylous Particles, and *cauſa commaterialis* be fetch'd, and derive its Production; which Supply is never wanting, not even at that time?

It is not to be ſuppoſed or imagined, that the ſtagnant Blood ſhould give place to the Chylous Particles to get into the Veſſels, to be converted into *Pus*; this may juſtly ſeem a

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* Oper. Med. Tom. 2. pag. 21.

Wonder, and not a little unreaſonable, and (to me) improbable. But it is no wonder to ſee Veins and Arteries lie untouch'd, and a Congeries of ſmall Channels, or Blood-Veſſels, of a lax, ſoft, and tender Make, all ſuppurated, they being eaſily compreſs'd, and Circulation checked, *&c.*

Here the Dr. enters upon a larger and more particular Diſcuſſion of this Subject. But I ſhall proceed to give an Inſtance, which I think will ſufficiently prove, that the *Lympha* or *Serum* cannot be made *Pus.* " There was a luſty young " Man had a general *Anaſarca* over " his whole Body; his two Phyſici- " ans, after they had diſpatch'd the " Evacuations by *Catharticks*, and " had paſs'd ſome Weeks in the " Courſe of the Alteratives, at laſt " gave way to the Patient's continu- " al Cry for haſtening his Cure, and " therefore concluded from Dr. *Sy-* " *denham*'s wrong Ætiology of Steel

“ (who affirms in his Diſſertation of “ the *Hyſterick Affection,* that it “ ſtrengthens and comforts the Blood “ and Spirits thence derived, becauſe “ it raiſeth a volatile Ferment in the “ vapid and languid Blood; by which “ the Spirits are excited and lifted “ up, which were before extremely “ low and oppreſſed with their own “ Weight) to give him a light Preparation of *Aq. font.* impregnated with ſome Extinctions for his “ ordinary Drink, with a little white “ Wine: In a Day or two he had a “ Fever, tho' before he had none, “ and it was in the beginning of “ Summer, and a fine Seaſon. This “ happened from the genuine Quality of the Remedy (it being adſtrictory) which was given before “ the viſible Detumeſcence of the “ Parts or Depletion. Wherefore “ the Phyſicians obſerving in a Day “ or two, ſome Exacerbations towards Night, and Remiſſion in

“ the Morning, they reſolv’d to give
“ him the Cortex, whereupon he
“ took ℥i. *ſs. methodo Sydenhami.* But
“ the Fever grew rather higher, and
“ with ſome bad Symptoms; among
“ which was great Pain in the Thighs
“ and Legs. In about ten Days
“ there were Signs of large Abſceſſes
“ in the Interſtices of the Muſcles
“ of thoſe Parts; and upon Apertion
“ vaſt Quantities of concocted
“ Matter were diſcharged;
“ likewiſe the moſt part of that Matter
“ which ſwell’d the *Penis* and
“ *Scrotum* had the ſame Fate; but
“ the Patient languiſh’d daily, and
“ ſoon after yielded to the Diſtemper
“ per”. He farther adds,

“ Now I am apt to think, that
“ in ſo vapid a State of the Blood as
“ that of a Dropſy, there are very
“ few volatile Particles in the *Lympha*,
“ and Nutrition being ſpoil’d in this
“ great Coheſion of the Blood, much
“ of the chylous Particles is diſcharg’d

" charg'd into the little membran-
" ous Cells, among the nutritious
" Juice within the Interſtices of the
" Muſcles, and the *Cutis vera*, which
" takes many Months and great
" Art to be diſcharg'd. Thoſe there-
" fore in the preceding Caſe being
" attack'd by ſo briſk and generous
" a Remedy as the *Cortex*, and too
" haſtily, having no way to eſcape
" were put into a Ferment; which
" being continued ſome Days, with
" the Aſſiſtance of the neighbouring
" Heat in the Muſcles, were thus di-
" geſted into *Pus*, almoſt as com-
" pleat as is generally found in large
" Abſceſſes".

We are to underſtand by the firſt Article, that the concomitant Symptoms that attended this Caſe, were occaſioned by the too ſudden Adminiſtration, and by the Quality of the Remedies, to wit, Vitriol of *Mars*, and the *Cortex*, both the one and the other being adſtrictory, though the Dr. ſeems to be convinc'd (and that by an Experiment) that the *Cortex* is a * ſtrong evacuating Medicine.

For the more eaſy and clear Comprehenſion of the ſecond Article, let us examine the ground it is built upon, where the whole ſtreſs of the Argument depends. And that is, he endeavours to prove that the *Lympha* or *Serum* cannot be made *Pus*, by denying that it is the *Lympha* or *Serum*, that is lodged in the membranous Cells, within the Interſtices of the Muſcles, and imagining that they are Infarctions of chylous Particles.

Hence it muſt be confeſſed, that it has but ſmall Appearance of Weight or Reaſon in it, and that it is not at all ſatisfactory by his way of reaſoning, whether or no the *Lympha* or *Serum* may be chang'd into *Pus*.

But the main Difficulty is made eaſy from the Account given of this

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* Opera Med. Tom. 2. pag. 67, 68.

Diſtemper, by the modern and moſt rational Phyſicians, that it proceeds from too lax a Tone of the Solids, and a viſcid Blood, or the Veſſels being ſtraitn'd, or compreſs'd, ſo that they cannot give it Paſſage through them; whereby an Infarctus of the Arteries, and hence a retarded Circulation, which ſtuffs and blotes the Habit, or raiſes white Tumours in the Feet, Legs, or any other Parts.

Thus the *Lympha*, which being continually ſeparated by the *Glandules*, is check'd in its Diſcharge into the refluent Blood, by the Veſſels peculiar to it.

This is evident in ſuch as have *Pedes ædematoſi* (a ſoft and looſe Fleſh, a lax and cachetick Habit of Body) ſwell'd Legs, which tumify towards Night, and diſſipate in the Morning, after lying in a ſupine or horizontal Poſture, the Blood having a more eaſy Reflux, the Preſſure is taken off, the Impediment remov'd, which retarded the Motion of the *Lympha*, and its Diſcharge again into the common Stream.

Moreover in analyſing the Water, that is taken out by tapping the *Scrotum* in a *Hydrocele* (which was one of the concomitant Symptoms) and by the uſual Experiments made upon *Serum*, and particularly by putting a little of the ſame in a Spoon upon the Fire, it will immediately become a perfect Gelly; which is a Sign that it flow'd from the *Lymphatick Veſſels*, which do ariſe in great Numbers from thoſe *Glands*.

Now I ſuppoſe it will be readily granted, that I have proved the Matter of thoſe Abſceſſes to be *Lympha* or *Serum*; and in ſo doing proved the ſame is capable of being made *Pus*, and thereby have diſcuſs'd that Point.

But for farther Proof, and to better illuſtrate the Matter, we find by the Chymical *Analyſis* of Human

Blood, that the ſerous and fluid Part of the Blood affords the ſame elementary Principles or ſimilar Subſtances, both as to number and kind, that the fibrous and conſiſtent Part does; though not as to Quantity, that of the Oil and dry Salt being leſs in a determinate Proportion of *Serum*, than they would be in the like Quantity or Weight of the concreted Part of the Blood.

Therefore it is no wonder that the ſerous Part of the Blood, is liable to the ſame Change by Stagnation, as the concreted Part (they being of ſimilar Subſtances) though one may require longer time than the other.

Hence it is very natural to ſuppoſe that the confluent ſort of Small-Pox determine on the eleventh, and the diſtinct kind on the eighth Day. The former being a Suppuration of the Serous, and the latter of the Grumous.

Nor is it leſs natural to ſuppoſe, that moſt Fevers (whether continual or intermittent) have their Duration according to the time theſe require to be perfectly concocted, changed, altered, and brought to *Criſis*, one in the Glands, and the other in the capillary Arteries.

For it has been demonſtrated (and that beyond contradiction) that Obſtructions of the Glands and Arteries are the general and principal Cauſes of acute Fevers: And that theſe are the Fluids that continually paſs and re-paſs through thoſe ſpiral and contorted Channels.

To conclude, he tells us, that, "By all theſe Arguments therefore "it is not agreeable to Reaſon to believe, that any of the Humours "of the Blood are capable of Putrefaction, however for Diſtinction we muſt allow ſome Fevers to "be called putrid, and in theſe it "is no other than the chylous Particles,

“ cles, which in the proper time ap-
“ pear as νεφέλη, ἐναιώρημα, and
“ ὑπόστασις in the Urine”.

That Chyle is what ſuppurates in Wounds and Abſceſſes; and what appears in the Urine upon a Criſe, as *Nubecula*, *Enæorema*, and *Hypoſtaſis*; is to make it the *Cauſa ſine qua non*, (which is a *Chimæra* not to be found in many Authors) but here he copies after Dr. *Willis*, that intermitting Fevers proceed from the Chyle * (*è pabulo quotidiano ſuppeditatus*) being not aſſimilated through defect of Sanguification, and though endued with a good and natural *Diatheſis*, or Conſtitution, yet upon its Commixture with the *prava Diatheſis* of the Blood, is perverted, and becomes heterogeneous and fermentative Matter: in conſequence the Chyle though well and naturally confected, is impeached the Cauſe of the Fever; becauſe when concocted and excerned with the

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* De Febr. pag. 119, 120.

Urine, the Fever doth decline and finally ceaſe.

This *Hypotheſis* hath been ſufficiently decry'd, and the Cauſes of Fevers (ſince) better underſtood, that I need not canvaſs the Matter.

I have endeavour'd to be as little prolix and tedious as poſſible, in laying down a Solution to each of the foregoing Obſervations and Aſſertions. And though more may be ſaid upon this Subject, I think what has been ſaid already is enough to ſhew the Invalidity of what the Dr. has endeavour'd to maintain; and that there is ſufficient Reaſon to determine that nothing can be ſaid to avoid the Force of theſe Arguments.

Here follow Dr. *Hodges*'s Arguments * upon the ſame Subject; which run thus, " And firſt of all, " notwithſtanding the Blood which " runs in the Arteries and Veins does " ſometimes, though very ſeldom,

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* Vid. Loimologia. 2d Edition, by Dr. *Quincy*.

“ appear whitiſh; it then happens “ from too great a Mixture either of “ nutritious Juice, or of a degenerate Chyle, that will not eaſily “ change, and take its red Colour, “ but it never paſſes into Matter, “ becauſe the neceſſary Conditions of “ Circulation will not admit of ſo “ much Reſt as is requiſite thereunto; beſides even the extravaſated “ Blood will not eaſily undergo ſuch “ an Alteration: for when any Veſſels, and chiefly the *Capillaries*, are “ ſo obſtructed by Contuſions, or “ any other Means, that the neighbouring Parts ſwell, every Phyſician and Surgeon too, I hope, “ knows that diſcutient Medicines “ and Cataplaſms will reſtore the “ former Motion and Fluxility to “ the Blood, eaſe the Pain, and diſſipate the Tumour ”.

We all know that Blood cannot change into Matter, whilſt Circulation or progreſſive Motion is carried on: For Stagnation is requiſite to Corruption or Putrefaction; it is then inteſtine Motion commences, which deſtroys the Texture and Continuity, or ſpecifick Degree of Coheſion.

And it is not to be queſtion'd, but that diſcutient Medicines will reſtore the former Motion and Fluxility to the Blood, if it has not been too long ſtagnated and coagulated, that is, if the Solids have not entirely loſt their Vibrations, and a total Ceſſation of Motion among the Fluids. When it happens thus, the Solids may recover their Tone, and the Fluids their Fluidity: Otherwiſe it terminates in an Abſceſs.

In the next Place he tells us, that "If the Blood be too fluid in the "Arteries, it is apt to occaſion *A*-"*neuriſms*, and in the capillary "Veins an *Ecchymoſis*; but nothing is "more commonly obſerved in Prac-"tice, than that upon a Recovery of "the Blood's due Conſtitution or

" Circulation, the obſtructed Mat-
" ter in an *Ecchymoſis* will diſſipate
" through the Pores of the Skin, or
" be abſorbed by the refluent Blood:
" But when the Blood happens to
" be too grumous and ſtagnate, a
" Fever immediately ariſes, unleſs it
" be prevented by Evacuation; and
" in ſuch a Diſorder every one knows
" that there is moſt Danger of a
" *Schirrus*, or a Mortification ".

How too fluid a Blood ſhould occaſion *Aneuriſms* is not eaſily demonſtrated, for the general Cauſes of *Aneuriſms* proceed from a bad Diſpoſition and Texture of the Solids, as Inciſions, Contuſions, or a preternatural Diſtention, or a Corroſion of the Coats of the Arteries. And in like manner is produc'd an external *Ecchymoſis*: But the Nature of an internal *Ecchymoſis* is a Turgidity and Plenitude, the Veins and Arteries are over-ſtretched, and when the Blood happens to be thus accumulated in the Thoracick Veſſels, and hath got between the fine Membranes, that limit the internal Boundaries of Circulation, as the Skin doth the external; the Globules of the Blood are broke and fuſed in the *Serum*, or by Stagnation acquire an efficacious Means of Corroſion to get out of the Veſſels, and thereby produce a frequent Spitting of Blood.

But as to the main thing in Queſtion, that the obſtructed Matter in an external *Ecchymoſis* will always diſſipate, is falſe, for ſometimes it will turn into *Pus**: But the Blood being too grumous and ſtagnating will cauſe a Fever, and may cauſe a *Schirrus*, or a Mortification, or either of them, according to the particular Natures, Structures, or Situations of the Parts that it invades, and according to the Quality of the Blood, and the Degree of Stagnation.

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* See Page 102.

Here we have another Obſervation to corroborate and ſupport this Theory: " And as it hath been already " obſerved, that Blood could not be " drawn from the infected by Phlebo- " tomy, without loſs of Strength, if " not of Life, whereas the greater " Quantities of *Pus* were obtained " by Suppuration of their *Buboes*, " the Patient was ſo much the bet- " ter for it; it ſeems conſonant to " Reaſon, that if *Pus* was generated " immediately from the Blood, the " Strength would as much decay " upon its Loſs as upon Phleboto- " my: But I have always found it, " (as many Times already obſerved) " that how little ſoever the Quanti- " ty of Blood drawn away was, and " although done at ſeveral Times, " yet it proved of more Prejudice " to the Patient than an hundred " times as much Matter drawn from " a *Buboe*; and that the whole re- " maining Maſs was not able to

“ recruit the Loſs ſuſtained there-“ by ”.

That the infected might better bear a far greater Diſcharge of *Pus* (though generated immediately from the Blood) than pure Blood drawn by Phlebotomy, without a *Languor*, *Deliquium*, or even Death, I ſhall diſtinctly demonſtrate.

The Conſtitution having ſeparated, ſecluded, and critically diſcharged, thoſe Parcels of Blood that are already depraved, which cannot be aſſimulated into homogeneous Qualities, out of the Courſe of Circulation by the natural Diſcharges, by Tranſpiration, or by Abſceſſes. Hence it is that the more they diſcharge of this *Virus*, ſtill the greater Relief. *Ablata cauſa*----- And,

In this Caſe, there may be ſuch an immediate Depravation and Change in the Solids and Fluids which are abſolutely requiſite to animal Action, by thoſe extremely ſubtile Effluvia, in a Contagion, that the contractive or elaſtick Power of the Veſſels may be greatly diminiſh'd by the Viſcidity of the Blood, and the Obſtruction of the Fibres and capillary Veſſels; ſo that the critical Diſcharge by the *Buboes* being leiſurely ſecreted, the Veſſels have time to contract and recover their Elaſticity. But that by Phlebotomy is drawn off ſuddenly, and though at Intervals, yet it is not ſufficient; for the Blood flows but in a ſmall Quantity into the coronary Veſſels of the Heart, and conſequently a *Syncope*, or a Faintneſs muſt enſue, till the Veſſels can recover their Tone, and the Blood in all the Arteries comes to an *Æquilibrium.*

Here is another ſort of Impediment, ſo that we are inextricably involv'd in Obſervations and Arguments. " If they who eſpouſe a
" contrary Opinion, ſhould ſuggeſt
" that Blood may be drawn from
" a Tumour imperfectly ſuppurated,

“ and from thence conclude, that “ its Origin was from the arterial “ and venal Fluids, it may be readily anſwered, that on opening a “ freſh Tumour, a bloody Ichor will “ flow out, becauſe in the Operation ſome Blood-veſſels will be cut; “ whereas when the Tumour is in “ Maturation, the Quantity of Humour there collected obſtructs the “ Blood from flowing to it through “ its proper Veſſels; and which Humour, altho' in it ſelf at firſt more “ thin and crude, yet by the Heat “ of its neighbouring Parts, and its “ own natural Diſpoſition, it will afterwards thicken, and change into a white Colour of a laudable “ Conſiſtence ”.

To reaſon well concerning the Production of *Pus*, we muſt conſider well the Ground, Eſſence, or the only true Principle that produces it: Therefore that we may not be involv'd in an endleſs Labyrinth of Abſurdities and Contradictions, it is proper here to obſerve, that when any Tumour is laid open ſoon after it is form'd, to diſcover its Contents, it will diſcharge Blood, not from ſome Blood-veſſels, being cut, for if it be entirely extirpated, there ſhall not be the leaſt apparent Mixture of Chyle. And,

" *Thirdly*, To the foregoing it " may be added, that ſo far as the " Blood partakes of a ſaline Quality, " by ſo much the leſs will it be diſ" poſed to change into Matter; for " the ſame Reaſon that Sea-Water " cannot be boiled into a Gelly; for " Salts add to the Fluxility of Fluids, " and thereby prevent Incraſſation, " unleſs in thoſe Inſtances where " they of themſelves cryſtallize, by " Means of an Incapacity of the " *Menſtruum* to keep them in Solu" tion, which is foreign to the Caſe " before us".

The ſaline Quality of the Blood is no Reaſon that it ſhould not be diſpoſed to change into Matter; for Salts have their mechanical Modus of their diſſolving Power dependant upon this; ſaline Bodies diſſolv'd in Water, or any other Fluid, do attract and impinge againſt one another, whilſt they have a Diſpoſition to enter into a cloſe Connexion, and to combine together; and while ſuch Particles are violently agitated in the Fluid, and rubb'd againſt one another, they will by the ſame Impulſe grind and attenuate the Particles of the Fluid interſperſed between, and contiguous to them: And they deſtroy the Connexion of Aggregation, as there is in their Points and Angles, an aptitude to penetrate, adhere, and drive off.

Nor doth any thing appear more congruous to Reaſon, than that from the ſame Cauſe, the Chyle (which is commonly known by the Name of

Corpus imperfectè miſtum) whoſe Salts probably have more of the marine Nature, and are more diſengaged and at liberty to act according to their natural Propenſity; ſhould be more capable of attenuating and keeping the Chyle, than thoſe of the Blood from Coagulation; and the latter inſtantaneouſly coagulates as ſoon as depriv'd of its progreſſive Motion; ſo that the Salts cannot exerciſe their Power to keep it fluxible; therefore is not to be regarded as a Reaſon in this Caſe, in order to eſtabliſh this Opinion. And,

" *Laſtly*, Nothing is more known
" in Nature, than that Blood, by
" what Means ſoever extravaſated, if
" it cannot get back again into the
" Veſſels, will, after ſome Stagnati-
" on, run for the moſt part into
" Grume; ſo that when a Fluctuati-
" on requires opening, little elſe
" than a coagulated Blood flows out:
" And if any one pleaſe to receive
" the

“ the Blood from an opened Vein
“ into a warm Porringer, and afterwards place it in a luted Veſſel upon a Sand Heat, as near as poſſible, equal to that which is natural, he will find all Labour loſt in endeavouring to produce thereby any Appearances of *Pus* in it, either from its Colour, Smell, or any other of its requiſite Properties ”.

When ever extravaſated Blood appears in a Grume, or little elſe than coagulated; it muſt be by reaſon that it hath not had proper Time and Heat, in proportion to the Quantity extravaſated; for when an indurated Tumour comes to fluctuate and to be opened, *Pus* will immediately flow out. And the Experiment doth not in the leaſt illuſtrate the Matter: for to imitate Nature, ſeveral Circumſtances are to be minded, and indeed we cannot frame ſuch a Digeſtor, with all its Requiſites, that will produce this Effect: The Degrees of Heat cannot be adjuſted, and beſides the Blood coagulates too ſoon for inteſtine Motion to be introduc'd, ſome Degree of Fluidity being abſolutely neceſſary in carrying on a Fermentation; and every one knows how much Fluidity is a Promoter of Putrefaction, which in the animal Body is not deficient.

Here all our Obſervations, Experiments and Arguments, may be brought to center in this one ſingle Point, and thereby the whole diſcuſs'd: for this is Fact, and where Fact appears, Reaſon falls to the Ground.

* " And when you ſtop the Blood " from a freſh Wound, and cloſe the " Lips over it, ſo that it may yet " continue within the natural Heat " of the Body, and it will, after a " few Hours, obtain the Conſiſtence, " Colour, and Scent of a fœtid Mat- " ter.

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* Vid. Dr. *Bennet*'s Theatrum Tabidorum.

" ter". This is ſo obvious that it cannot be denied, that Blood doth undergo ſuch a Change when ſtagnated, *&c.*

Here the Dr. draws to a Concluſion. " Why then may we not con-" clude with ſome others of great " Note, that *Pus* is generated imme-" diately from the nutritious Juice, " not in the Arteries and Veins, but " in other Veſſels; in which Juice all " the requiſite Properties are to be " found, as a Diſpoſition to grow " thick, without ſmell, white, light, " and of a ſmooth Conſiſtence; and " I take it to be very probable, that " the *Pus* is made from hence by " the Aſſiſtance of the natural Heat, " and the Conveyance of it by the " fore-mentioned Veſſels into the " Glands whereinto they are com-" plicated, and not by any Means " from the Venal Blood, and much " leſs from the Arterial".

To conclude hence, that *Pus* is generated from the nutritious Juice, becauſe of its Similitude in Colour, and ſome other Properties, is of no great force; for *Pus* varies as to Smell, Colour, *&c.* according to the different Heat and Quality of the Blood, and of the different Circumſtances that attend its Production. And,

Here inſtead of reſting upon Reaſon and matter of Fact, we reſign to Authority the moſt irreconcilable Enemy to Truth and Argument: And we ſcruple to own a Fault with Authors we admire, juſtify *Homer* by *Virgil*, and *Virgil* by *Homer*; on which ſoever of the two the Objection falls, they take it for a Principle that the other is a Guard to him. Nothing is more unworthy a Man, than to let a received Opinion have with him all the Authority of Reaſon.

Among the many curious Obſervations made by Dr. *Friend* in his

Hiſtory of Phyſick (upon the modern Practice and Theory, as well as antient) he has been very particular upon Tumours, in order to form a right Notion of Diſcuſſion and Suppuration, and the way how to effect both: And is of Opinion, "That if this Part of Surgery were "ſet in a more diſtinct View by "thoſe that are Maſters in that way, "and the Effects of outward Appli-"cations better adjuſted and ex-"plained, nothing would give us a "greater Light into the Virtues and "Operations of internal Medicines".

Moreover he hath given us the Opinion of all the moſt authentick antient Writers; and others of latter date (to confirm his own) to put a Period to the Diſputes ſo uncertain and precarious concerning *Aneuriſms*.

The thing in queſtion, is whether a Rupture of the Coats of the Artery, be not a conſtant Concomitant in an *Aneuriſm*; I ſhall not criticize thereupon, but that Dilatation, and Laceration, or that made by Puncture, are equally term'd *Aneuriſm*. But whether an Artery is not capable of a very conſiderable Dilatation, as that of a *Varix*, or greater, without cauſing a Rupture, the Certainty of which muſt be found out by juſt Obſervations, which is the Method already taken.

Therefore I ſhall take into Conſideration, only what is pertinent in Relation to the Subject of this Eſſay, and that is, the Dr. takes notice that, " The chief Arguments, which
" the Aſſerters of Dilatation urge,
" and which thoſe who acknowledge
" a Rupture in the Artery are at a
" Loſs to anſwer, are only two; how
" comes it to paſs, if the Blood be
" not confin'd within the Coats of
" the Veſſels, that there is a Pulſa-
" tion in an *Aneuriſm*? How is
" it that the Blood, if extravaſa-
" ted, does not turn to *Pus*? As to
" Pulſation

" Pulſation, it may, I preſume, be
" eaſily conceived, how the con-
" ſtant Impulſe of the Blood in the
" Arteries may communicate a Mo-
" tion to that, which lies contiguous
" to it, tho' extravaſated. The Force
" of Percuſſion is vaſtly great; and
" we find by Experiment in a Blad-
" der full of Air, the leaſt freſh
" Impulſe from a Syringe will move
" all that is contained in it, and
" diſtend its Sides. If the Artery
" is large, if it lies ſuperficial, and
" near the Center of the Tumour,
" and if the *Aneuriſm* be not dif-
" fuſed too much lengthways, the
" Pulſation will be ſtrong, tho' the
" Coat of the Artery be burſt: And
" this may be prov'd not only from
" Reaſon, but from Matter of Fact.
" We have a Caſe in *Severinus*,
" where, upon a Wound in the
" great Artery of the Thigh, there
" was ſo violent a Pulſation in the
" Swelling, as to lift up both one's

" Hands, when laid upon it. When " the *Aneuriſm* lies deep among the " Muſcles, very often the Pulſation " is not ſenſible. We may add to " this, that it may grow obſcure, " and at laſt be utterly extinguiſhed, " as the Coagulation of the Blood " increaſes: And of this we have " Inſtances both in *Severinus* and " Mr. *Littre*, where the Pulſation " was very violent at firſt, and afterwards entirely vaniſh'd. And " therefore we muſt not look upon " this as a conſtant Concomitant in " the preſent Caſe: What hath been " ſaid of Pulſation may let us into " the Solution of the ſecond Objection, for if we conceive, how " there can be a Motion communicated to the Tumour, we may " naturally and eaſily comprehend " how the ſame Motion may preſerve the Blood from Putrefaction " as well as if it was contained in " the Coats of the Artery, enlarged

" by Diſtention only. A very little Degree of Impulſe will ſerve " to hinder a large Maſs of any " Fluid from an entire Stagnation. " Accordingly in an *Ecchymoſis*, the " extravaſated Blood we ſee, very often does not ſuppurate, or when it " does there is ſome Part of it found " turn'd to a red *Coagulum*, diſtinct and " ſeparate from the reſt, without " any Mixture of *Pus*. The very " Caſe we have mentioned in *Severinus* comes up to the Purpoſe; " where after the Tumour had been " growing forty Days, there was " taken out of it ſix Pounds of pure " Blood, extravaſated between the " Interſtices of the Muſcles, and it " had no ſort of Tendency to *Pus*. " Beſides I believe the very Poſition " which theſe Writers lay down, that " all extravaſated Blood turns to " *Pus*, may be juſtly queſtioned: " What Quality 'tis in the Blood or " what Particles they are, which dif-

" poſe it to Suppuration, is a Pro-
" blem, I confeſs difficult to be
" ſolv'd; but ſure I am, there is
" ſomething in arterial Blood, which
" often hinders it from being chang'd
" into *Pus*, tho' extravaſated."

Whether the World will arraign me of Vanity, or not, that I have preſum'd to ſolve this Problem, ſince the very learned Doctor thinks it ſo difficult; and becauſe we may juſtly lay great Weight upon the Judgment of ſo experienced and judicious a Perſon as concerning the Sincerity of any phyſical Problem, his Aſſertions being ſeldom leſs than demonſtrable.

Therefore ſhall not mention his Name without a ſtrict Regard in paying him the Deference due to his Merit, which is too well known to ſtand in need of an Encomium: For he has given ſufficient Teſtimony of his Knowledge in the Medical Art, in all its Branches.

I am too ſenſible that what I am about to maintain, will be with more Difficulty admitted of, after being in the leaſt rejected by ſo great an Authority. Notwithſtanding I cannot but indulge this Inclination, for from thence have received ſeveral Advantages; and my Curioſity draws me to enquire narrowly into the Occaſion of ſuch a Report; and ſhall (I hope) by the Doctor's Aſſiſtance make it appear that the arterial as well as venal Blood ſuppurates when out of the Force of Circulation; otherwiſe, what I have here advanced muſt fall to the Ground.

The Doctor doth not object againſt venal Blood, but is ſure that there is ſomething in arterial Blood, which often hinders it from being changed into *Pus*, tho' extravaſated. And a famous Inſtitution Writer, is of the like Opinion *. But I am of Opinion (with Submiſſion) that the Miſtake lies in a wrong Obſervation, and that it doth not proceed from any Difference in their component Parts.

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* - - - - - - Sanguis Lienis magis eſt diſpoſitus ad putredinem, quàm Hepatis, & hujus magis quàm Cordis dextri ventriculi. Deinde minùs putreſcit Sanguis Arteriarum, *&c.* Gaſp. Barthol. Inſtitut. Anatom. pag. 83.

And that the whole Affair both as to the arterial and venal Blood, may be accounted for equally, by the ſame way of Procedure: Moreover that there is not, nor can be any better Solution of the Problem, than what the Doctor has already given us; excepting that of an *Ecchymoſis* (or thoſe livid Spots or Blotches in the Skin, ariſing from the Extravaſation of Blood) which I am apt to think, when any Part of it doth become a red *Coagulum*, and not ſuppurate, that it doth not proceed from any Motion communicated to it; but rather becauſe it becomes immediately arid from the Heat of the Body, and from its being ſo finely extended between the *Cutis vera* and *Epidermis*, and the moſt tenuous Particles being carried off by inſenſible Tranſpiration, or by Tranſcolation admitted to re-circulate. Thus it is depriv'd of that Fluidity which is requiſite to carry on that inteſtine Motion, *&c.* For * "When the "Effuſion of Blood is but in a ſmall "Quantity it inſenſibly reſolves, but "when there is much it produces "an Abſceſs, which never termi- "nates any otherwiſe than in Sup- "puration."

But the Doctor very well obſerves that a very little Degree of Impulſe will ſerve to hinder a large Maſs of any Fluid from an entire Stagnation. So that probably the Caſe mentioned in *Severinus*, where the extravaſated Blood fluctuated and a Motion communicated to it, prevented its changing into *Pus.*

This ſeems to be the genuine and only Cauſe, and not any Quality or

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* See Monſieur *Dionis*'s Courſe of Chirurgical Operations. pag. 473.

Particles in its conſtituent Principles different from venal Blood; for I take them to be one and the ſelf-ſame Fluid.

Tho' ſome may object that the arterial Blood parts with ſome alimentary and nutritious Particles, in its progreſſive Motion, which ſerve either for Accretion, Nutrition, or Reparation: Whereas the Venal being only the Refuſe of thoſe Secretions, returns to the Heart.

But admitting (to obviate the Objection) that the arterial Blood has *Succi Nutritii* or *Alibiles* mixed with it; it will be ſtill more liable to ſuppurate, according to the Doctrine of ſome modern Authors (particularly what I have before recited) who will have it, that the *Hypoſtaſis* that appears in the Urine upon a *Criſe*, is only chylous Particles, and what likewiſe appears in ſuppurated Wounds and *Apoſteme's*

The Experiments made upon the Blood of Animals by Dr. *Pitcairne* and others * do ſufficiently demonſtrate that the arterial and venal Blood is the ſame Fluid: For being mixed in the ſame Manner, put on the like Appearances, and differed in Degrees only; and that very inconſiderably, and probably, it proceeded from no other Cauſe, than the Alteration it receives in paſſing from the Arteries into the Veins, and that only a greater Tenuity, or Diviſion of its Globules.

For an Artery is a cylindrical or conical Channel conveying the Blood from the Heart to all the Parts of the Body, and being drove ſo forcibly, and ſo ſtrongly reſiſted in its Paſſage through a conical, flexible, and greatly elaſtick Tube, it follows that the Blood muſt be comminuted in Proportion to the Acceleration, Agitation

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* See Experiments relating to *The Specifick Gravity of Human Blood*; by Dr. *Jurin*.

tion, and the Elaſticity of the Solids.

And the Reverſe in the Veins, for the Blood is thrown into them with a continued and uninterrupted Stream, moving from a narrow Channel to a wider, conſequently coaleſce *; for as it is conſtantly forming it ſelf in little Spheres like that of Quick-ſilver, according to the Diſtance, Attrition, and Degrees of Motion; and *vice verſâ.*

It ſtill remains that I ſhould make it appear by their chymical Analyſis (which is one great Help towards the Underſtanding of Nature) that they yield the very ſame elementary Principles, or ſimilar Subſtances, as to Proportion, Number and Kind. Which Autopſy may be done (to any one's Satisfaction) by ſuccedaneous Experiments, that is upon the

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* Cum enim ſegniùs moveatur Sanguis, deficit illa particularum attritio, quæ cohærentiam prohibet; ita cùm minor ſit Globulorum in ſe invicem actio, facilior erit unio, & compages denſior. Friend's Emmenolog. pag. 132.

Blood of Beaſts, (by way of Analogy) in ſuch Caſes and Circumſtances, wherein the arterial Blood of Men, cannot be procured, Arteriotomy being an Operation not much in Practice.

To cloſe this ſhort Diſcourſe, if there be any Particles of peculiar Quality in arterial Blood, that the venal Blood has not, they are ſuch as recede, fly off, and eſcape our Scrutiny: Therefore ſhall not trouble my Reader with any more Inſtances of the like Nature: For what has been ſaid will be (I think) ſufficient to convince any unprejudiced Perſon.

Dr. *Robinſon* in his Book *Of Conſumptions*, Pag. 28. gives his Opinion of Sanguification and Tranſmutation of Blood, in the Manner following. "We have conducted the
" Chyle thro' all its different Chan-
" ges, till it comes to a red fibrous
" Liquor we call Blood, the ſmalleſt
" of

" of whoſe Particles, being more
" and more divided, change into *Serum*, a light thin Liquor, in which
" the red Globles ſwim. Whether or
" no thoſe red Globles may not have
" ſome Analogy with thoſe white
" Globles that compoſe the Chyle
" before it paſs the Stomach, and
" the *Serum* with the clear tranſparent Liquor in which they float,
" is a Queſtion I ſhall leave to the
" Determination of Gentlemen more
" converſant in thoſe Experiments:
" Yet certain I am, that the red
" Globles change into *Serum* upon
" Motion and Diviſion; and the *Serum* by the ſame Laws is exalted
" into a Fluid fine enough to nouriſh
" the Body." Again Pag. 42.

" It is reaſonable to ſuppoſe that
" the *Serum* is the red Globles minutely divided; for this Reaſon
" the Chyle is continually changing
" into red Globles, the red Globles
" into *Serum*, and the *Serum* into
Lymph

" Lymph fitted for the Purpoſes " of Nutrition, *&c.*"

I can't gueſs what Colour of Reaſon the Doctor could have to think that the *Craſſamentum* doth change into *Serum* upon Motion and Diviſion; It could not be that Experiment " of " ſcourging a Dog *, to put his " Blood into the higheſt Ferment it " was capable of undergoing, then " opening the crural Vein, and " drawing Blood which appeared of " a fine, bright red Colour, and " did not ſeparate into a *Serum* and " *Craſſamentum* for near nine Hours; " and the *Craſſamentum* was much " ſuperior in Quantity."

" The ſame Animal being kept " to ſhort Allowance and quiet, and " opening the ſame Vein, but this " was ſo different from the former, " both for Colour and Conſiſtence " that if he had not been an Eye-" Witneſs of the Experiment he

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* Friend's Emmenolog. pag. 30.

“ ſhould not have believ'd they both
“ came from the ſame Animal: For
“ the latter was a poor watry Blood
“ in which the *Serum* greatly ex-
“ ceeded, *&c.*”

This can be but a ſorry Inducement to believe that the *Craſſamentum* doth change into *Serum* upon Motion and Diviſion; for then there appear'd leſs *Serum* than when the Blood was calm and in a leſs Hurry. But I'm far from thinking that the *Serum* doth increaſe or diminiſh upon Motion, *&c.* For when the Globules of the Blood are minutely divided, they require a larger Space, and touch in ſo many the more Points, and the *Serum* is ſo confounded with the grumous Part, that they appear to the naked Eye to be one Liquor. And being out of the Force of Circulation, it coagulates too ſoon in the Baſon, for the Globules to form and return to diſtinct Fluids.

And the Attraction is ſo great, (for the Attraction of Bodies, is as the Square of their Diſtances) and the *Serum* ſo intermix'd that there can be but little of it (and that not readily) diſengage, but appears ſome time in *Lachrymæ*, ouzing out: But if this was receiv'd into a warm Veſſel, and immediately examined by a Microſcope, or view'd in a living Body (where Circulation is evidently carried on) under the ſame Circumſtances; no doubt it would appear as it did before it was put to this Hurry, only the Globules more numerous and minute. And,

As to the Difference in Colour, Motion and Diviſion render the Blood of a brighter Colour, and a Retardation of Motion renders it groſs and opake: The former admitting the Rays of Light thro' it, and the latter the Reverſe: Hence appear'd the Difference in Colour. *Qualis cauſa, talis effectus.*

I ſhall proceed a little farther in Anſwer to this Detail of the Dr. *viz.* It is not very reaſonable to ſuppoſe that the *Serum* is the red Globules of the Blood minutely divided; tho' he is certain that they do tranſmutate into one another (and differ only *gradu, ſecundum magis & minus*) upon Motion and Diviſion; but it is more reaſonable to believe that they continue two diſtinct Fluids, analogous to its primogenial Fluid Chyle; as appears by the moſt juſt Obſervations and evident Principles. For,

The Chyle before Aſſimilation appears by microſcopical Obſervations to be two diſtinct Fluids, analogous with the Blood. And the *Serum* and *Craſſamentum* chymically analyſed, differ as to the Proportions of their conſtitutive Principles, which is ſufficient to ſhew that they are not the ſame Fluid.

Hence it appears how inſufficient Motion and Diviſion are to reduce the one into the other: And how inſufficient the *Serum* alone by its Exaltation is to nouriſh the Body; I ſhall leave any one to judge that has read and contemplated the leaſt upon the Subject of Nutrition. And again *,

" Indeed, ſeveral Authors of the
" laſt Age endeavour'd to diſcover
" the Principles of the Blood, by
" ſeverely torturing it in a chymical
" Furnace; but all they acquir'd by
" their Labour and Pains was only
" to know, that it conſiſted of the
" ſame Principles that enter into the
" Compoſition of all other Bodies
" in the Univerſe; beſides, by their
" different Degrees of Fire, they
" render'd it a quite different thing
" from what it is in the Veſſels, and
" as it exiſts in Circulation: Nor
" have they ſucceeded better, that
" have

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* Friend's Emmenolog. pag. 33.

" have form'd their Experiments up-
" on mixing ſeveral Preparations
" with this Fluid to try which would
" diſſolve, which coagulate it; for
" thoſe will diſſolve it while in the
" Veins, that will coagulate it when
" without the Laws of Circulation,
" as appears from ſeveral Experi-
" ments I have made."

What is here alledged againſt the ſeveral Authors of the laſt Age, that diſcovered the Principles of the Blood by Chymiſtry; all that they acquir'd thereby, was not only to know that it conſiſted of the ſame Materials that conſtitute all natural Bodies; but what Proportion of each of thoſe Principles enter'd the Compoſition: Which is ſo notorious and general as to have an univerſal Approbation and Conſent.

For if all Bodies were compoſed of the ſame Principles in juſt Proportions, and did not differ *toto genere*; there would not be that Variety in the Creation, as the Law of Nature teacheth us.

Pondere, Menſurâ, & Numero, Deus omnia fecit.

It cannot be denied, but that the Fire deſtroys the Texture of the Blood, by unlinking and diſengaging its Parts to diſcover the juſt Proportion of each particular conſtitutive Principle; notwithſtanding theſe were pre-exiſting in the Compound *.

But how far we can depend upon the Doctor's Experiments confuting thoſe form'd by others, to find what Medicines do attenuate, or coagulate the Blood, by mixing 'em with it, out of the Veſſels, we have ſcarce room to judge, ſave, an *ipſe dixit.*

It may be that he, as well as others, may ſometimes be miſtaken, attributing the Effects and Alterations to the Ingredient, from whence the Infuſion or Tincture takes its Name; at the ſame time may be owing to the *Menſtruum*, *&c.*

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* See *Boyle's* Sceptical Chymiſt.

But without doubt whatever diſſolves, attenuates, or incraſſates it primarily, will produce the ſame Effects, both *extra* and *intra Vaſa.* But thoſe that attenuate by their Gravity, or by cauſing a greater *Impetus*, or coagulate by retarding the Motion, may be excepted againſt.

Dr. *Strother* in his Eſſay on Sickneſs and Health, where treating of an Ulcer of the Kidneys, delivers his Opinion concerning the Nature and Properties of *Pus*, *viz.* " Matter and " Phlegm differ in their Gravities, " becauſe Phlegm ſwims upon, and " Matter ſubſides in watery Liquors; " in this Caſe then what is evacuated, " is truly Matter, which ſeems to be " the Oils of the Blood corroded by " the concentrated Acids and ſtrict- " ly united; there is greater Analo- " gy between theſe heavy eſſential

“ Oils and Matter than is imagin'd,
“ and tho' Matter will neither be
“ coagulated by Fire nor acid Spirits;
“ yet there is a way by which it will
“ blend with Water and be united
“ to it: Matter ſmells ſtrong, ſo do
“ theſe Oils taken internally raiſe the
“ like Hurry in the Blood with Mat-
“ ter included in it, as is well known
“ by the giving them internally, but
“ their Ungratefulneſs makes them
“ rejected in Practice”.

The great Analogy between heavy eſſential Oils and Matter, he imagines, is becauſe they both ſmell ſtrong. But I muſt beg leave to tell him, that laudable Matter doth not ſmell ſtrong, but is ſo inodorous, not as much as to offend the moſt delicate; unleſs retain'd too long in deep Sinouſes, or cancerous Ulcers; and the Sulphur exalted by over-much Heat (acquiring that empyreumatick Smell) or where the Bones are carious and become fœtid, tranſmitting thoſe fœtid Oils like that of Hartſhorn or Bones before a compleat Calcination. And when it is become thus, it may be ſaid to ſmell ſtrong, nay ſtink; which cannot be ſaid of eſſential Oils. For they have only the genuine Smell of the Plant that they were drawn from by Diſtillation.

Another Reaſon for this great Analogy, is becauſe they raiſe the like Hurry in the Blood, with Matter included in it.

It is true that they will hurry the Blood, but whether they will cauſe thoſe hectical Paroxiſms, which are the conſtant concomitant Symptoms of an inward Ulcer, or Matter admitted into the Blood in putrid Fevers: Or whether the Method Nature takes in the Expulſion of theſe heterogeneous Particles be not very different, may be doubted of: And that other Things may cauſe the like Hurry in the Blood, tho' different as to their eſſential Principles.

There is another Analogy between eſſential Oils and Matter, and that is in Point of Gravity, they will ſubſide in Water, but theſe are but few among the vaſt number of eſſential Oils in uſe. I know only *Ol. Cinnamomi, Cariophillor.* & *Lign. Rhod.* that are ſpecifically heavier than Water. And theſe as to their Smell very agreeable and pleaſant; otherwiſe it would make for the Doctor did they likewiſe ſmell ſtrong or fœtid: For they would have both the Properties of Matter.

I do remember to have read in one of his Books, that Matter will not burn tho' put upon a hot Iron, or thrown upon hot Coals. Herein is no Analogy. But,

The Reaſon why Matter doth not burn, when put upon thoſe Trials, is the ſame as with Blood; whoſe humid or aqueous Parts muſt be diſſipated before the active, ſaline and ſulphurous Principles can exert themſelves to emit a Flame.

Neither ſhould we wonder, if Matter did not coagulate by Fire or acid Spirits; tho' it be an immediate Production from the Blood: For it is become heterogeneous by a new Concentration of Parts. And as to his Method (reſerv'd) of blending Matter with Water, it muſt be by way of Analogy, and by Parity of Reaſon the ſame as that of incorporating eſſential Oils therewith; which is well known to the meaneſt Tyro in the Spagyrical Art.

Theſe Reflections and Aſſertions will appear more ſtrongly ſupported as I proceed, by Circumſtances moſt convincing; being drawn from certain and immutable Principles, and fix'd on the Baſis of Nature.

The Reverend Dr. *Hankcock* in his *Febrifugum Magnum*, makes Water a *Catholicon* in all inflammatory Caſes whatſoever. And unleſs we ſhun the Method of *Acron Agrigentinus*, who, neglecting the Reaſons of Things, contented himſelf with bare Experience; we ſhall fall into great Miſtakes by applying too univerſally in all Caſes and Circumſtances alike.

It will be a Digreſſion here to make any Remarks touching the Benefit and Advantages of it in Fevers, *&c.* as being foreign to my preſent Deſign; but will readily concur with him or any other in Praiſe of Water as a Regimen or Diet, though now a-days inſtead of Water (which was the greateſt Part of the Drink in the Antediluvian World, and very congenial to the Temper of Man) we drink the ſame Element impregnated with the Particles of the Grape, Barley, or Sulphur, which are very pernicious if commonly uſed, and eſpecially to exceſs; for they deſtroy the *Calidum innatum*, (or rather the Effect only of a circulatory Motion of the Blood) prey upon the roſid Juice, change the natural Tone of the Stomach, the Texture of the Body, and the Craſis of the Parts; hence come Atrophies, the Imbecillity of our Nerves and Trepidation of our Members, *&c.*

The ſame Element *in puris Naturalibus*, that is, not impregnated and ſaturated with other Bodies, will dilute the Blood and diſſolve and carry off the ſaline *Spiculæ*, and by that Means remove and prevent moſt chronical Diſtempers; and in ſhort, will cauſe a good and perfect Concoction; ſo that a good Habit of Body will be eſtabliſh'd, the Maſs of Blood hath its pure Tincture, all the *Apporhœa* of the Body have their peculiar Properties ſuitable to the Intention of Nature.

I ſhall go no farther with this Digreſſion, but will take to Conſideration what comes naturally under the Subject I treat, *viz.* The Doctor ſeems to wonder, "That Dr. *Sydenham* ſhould inculcate the Notion "of Concoction. And that Dr. "*Pit-*

“ *Pitcairne*, who in his Rationales
“ and other Theories has run counter
“ to many Phyſicians, yet retains the
“ Notion of Concoction. And the
“ Doctor believes, Phyſicians have
“ hardly been more miſtaken in
“ any one thing, than this Notion
“ of Concoction, *&c.* except in
“ Wounds, Boils, and Apoſtemas in
“ the out Parts, which do concoct
“ and become *Pus*. And he thinks
“ he may ſay, there neither is, nor
“ can be any ſuch Concoction of
“ the febrifick Matter in the Blood;
“ for as it would totally ſtop the
“ Circulation, ſo it is impoſſible ſuch
“ Matter ſhould ever get through
“ the capillary Arteries, *&c.* ſo as
“ to be carried off either by inſenſible
“ or ſenſible Perſpiration”.

I ſhall here in few Words remove one, and the only one Objection of the Doctor againſt Concoction of the febrifick Matter in the Blood; for conceding of Stagnation of Humours in any one Part, doth not impede the Circulation of the Maſs in any other Part, but where the Stagnation is; and finding a Reſiſtance or Excluſion, the circulating Blood doth preterflow through the lateral Branches, or next Paſſages that are patent.

Therefore rejecting all ſuch *Hypotheſes* and imaginary Theories, I ſhall ground it upon the trite Maxim of Phyſick, that Humours *extra vaſa* putrify. This being granted, I hope that they will allow, that *intra vaſa* when out of the Force of Circulation they will likewiſe putrify or ſuppurate, according to the Dictates of *Galen*, *&c.* For thoſe things which are out of the Force of Circulation, ought to be accounted out of the Animal, altho' they are within a living Body.

I think that there is no need of any farther Demonſtration, that the Blood doth putrify both *extra* and *intra vaſa*, but when? Not immediately,

ately, as appears in moſt *ædematous*, *ſchirrous*, or aqueous Tumours, and many *Ecchymoſis* not tending to Putrefaction before a long Interval of Time; though in ſome Caſes, where the external and internal Pores are quite ſtop'd and choaked up; and the crude Blood ſtagnated a conſiderable time, having acquir'd a preternatural Craſis, Diſpoſition or Quality, immediately ſuppurates.

According to the great Lord *Verulam*, upon the Subject of Putrefaction. "And this doth appear more "evidently in Agues, and come "(moſt of them) of Obſtructions "penning the Humours which there-"upon putrify." And being incapable of Aſſimilation to the univerſal Maſs, muſt be carried off by Urine, Stool, and Tranſpiration, as is manifeſt in Agues and putrid Fevers.

And in conſumptive Caſes, proceeding from a Decay of the Lungs, or any of the noble Parts, it is very common to ſee, during the time Matter is forming, and whilſt it is making its Exit, a regular Paroxyſm of a Fever, * ſo exactly reſembling that of a common Ague; beginning firſt with a cold ſhivering Rigour, † after that with a hot burning Fit, and when that is off, with profuſe Sweats. This is one of thoſe kind of Fevers which are call'd Putrid, where the Humours, or part of them, have ſo little circulatory Motion, that they fall into an inteſtine one, and putrify.

It is no wonder that ſcarce any Medicine prevails in theſe Caſes, and that the Perſons that labour under theſe Diſtempers become irrecoverable; becauſe the Veſſels are ſo enervated

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* Febris à Sanguine extra vaſa derivato, & corrupto ut in tûmoribus, percuſſionibus, &c. partim ex dolore, partim ex materia, quæ cum ſanguine miſcetur, &c. Bellin. de febr. pag. 413.

† Rolfinccius, cap. 60. pag. 205. Rigoris cauſa à circulatione Sanguinis ex parte impeditâ. Zacut. Lucitan. pag. 329. Ex qualibet putredine, rigores, horroreſve excitari ubique tradidit Galenus.

vated and extended beyond their natural Power of Reſtitution *, and infarcted that their Parietes or Sides are not able to reſiſt the Pondus of the Blood, conſequently muſt ſtagnate, diſtend, accumulate, and thereby occaſion Impoſtumes and Ulcers; and having naturally by the Law of Circulation, a conſtant Supply of Blood flowing to the Parts, to be converted into Matter, and lying in a manner out of the Reach of Medicine, makes it appear very difficult to effect a Cure.

Above all other Medicines, Fumigations have the faireſt Chance in an Eroſion of the Veſſels or Breach of the *Parenchyma* of the Lungs (eſpecially if they have their Seat in the *Trachea* or *Bronchiæ*) becauſe they are convey'd with the Air by Inſpiration, and locally applied; ſo that it ſeems

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* ------- Tono partis præ nimiâ diſtentione tandem penitus everſo Inflammatio & Apoſtema ſuperveniant. Morton de Phthiſi. pag. 98.

a much more natural, eaſy and effectual Method, than Pectoral Linctus's, Electuaries, Bolus's, Powders, and Apozems, which muſt undergo great Alteration before they arrive at the Part affected; in order to deterge, incarnate, and cicatrize.

In the Vegetable Kingdom none more cried up for a Thoracick, than * *Tuſſilago ſeu Farfara*; and indeed found good in Coughs, Defluxions of Rheum, and an Ulcer of the Lungs, if ſmoak'd in a Tobacco-Pipe: Yet mix'd with Balſamicks may very much exalt its Virtue, which Opinion Experience ſeems to confirm; and Reaſon enforces that we ſhould attribute theſe following Effects, partly to the additional Forces.

It may be objected, that though this Plant makes a ſmooth and healing Decoction, to temper and invelope the Acrimony of irritating Salts, and to ſupple and mollify the tenſe and divulſed nervous *Fibrillæ*: Yet when the Texture is broke (by Fire) the Principles diſengaged, the eſſential volatile Salts ſet at liberty to take to their Wings, quit their Quarters, wherein they were link'd, lull'd and unactive. But thus render'd quick, penetrating and unſheath'd, may offer Violence to the tender Parts abrading and inflaming of them.

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* Plin. Quòd fumus ejus per arundinem hauſtus, tuſſim quantumvis veterem ſanare dicitur.

To remedy this; they are centemper'd with the ſulphurous Fumes of the other Ingredients, and being thus compounded, we have a Medicine that will anſwer all the Intentions requir'd to remove this Herculean Diſtemper, (which has been always pronounc'd incurable) by deterging and mundifying the Ulcer, exſiccating the ſuperfluous Humidity, cloſing up the Mouths of the Veſſels, bracing the over relax'd Fibres to recover their Tone, and thereby preventing a farther Influx of Humours, *&c.*

We need not ſupport its Praiſe by any Rationale, ſince Experience (the Mother of all Knowledge) confirms, that it performs a Cure beyond all other Medicines. For inſtance,

The worthy Mr. *Boyle* * (whom I had occaſion to mention ſo often) ſays, that the Leaves powder'd with Flowers of Sulphur and Amber, and ſmoak'd in a Tobacco-Pipe, have cured a Conſumption. But,

I have of any the greateſt Reaſon to ſpeak in Praiſe of this Method; for I had occaſion to try the Experiment upon my ſelf, after expectorating the ruſt-coloured, fœtid and purulent Matter, which ſubſided in Water, if diſengaged from the Phlegm which adhered to it. And all this without an *Hæmoptoe* or *Sputum Sanguinis* preceding.

But after ſome time perſiſting in this Method of ſmoaking, did not expectorate any of the aforemention-

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* Uſefulneſs of Experimental Philoſophy.

ed Appearances, nor any other (excepting common Phlegm) for eight or nine Days; at which time, it would be pump'd up from its Lodgment, always of the ſame Figure and Size, reſembling blue Clay, of a ſoft and looſe Texture; but at laſt of a brighter Colour (arid and brittle) reſembling common Brimſtone: Which Hue (both of this and the former) might be owing to the ſulphurous Fumes of the Remedy.

All which induce me to believe that it was an Ulcer in the *Trachea* or *Bronchiæ*, and the laſt Appearance a Sign of a *Cicatrix*. This * alone has hitherto (it being now five Years ſince) had the deſir'd Effect.

I ſhall not preſcribe Rules, as when to ſmoak and how frequent;

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* ℞ Folior. Tuſſilagin. inciſ. ℥iv. Succin. Thur. Maſcul. Maſtic. āā ʒi. Semin. Coriandr. contus. ℈iv. M. F. Pulvis Craſſus, prout Nicotiana vulgaris uſurpandus.

Alitèr.

℞ Fol. Tuſſilagin. ℥iv. Terebinth. venet. (ad durit. vel ad debitam conſiſt. coct.) ʒii Styrac. Calamit. Benzoin. āā ʒſs Sem. Coriandr. ʒj M. S. A.

and what preparatory Method (that I leave *Judicio Medici preſentis*) all which may be neceſſary. For the beſt Remedies have their *nocumenta* (*nil prodeſt, quod non lædere poſſit idem*;) when ill-adminiſtred, over-dos'd, or abus'd thro' Folly and Ignorance.

Having gone thro' my firſt Propoſition, Tranſmutation of Blood: I come now to give the *Ætiology*, or an Account of the immediate Cauſe of putrid Fevers or Agues; in order to account how the *Cortex* gives that ſudden and wonderful Relief in all intermitting and periodical Diſeaſes.

The Ancients divided the Maſs of Blood into Bilious, Pituitous, Melancholy, and Sanguine; and aſſign'd the Cauſes of Fevers to the Predominancy of one or other of the divided Humours in the Body, and theſe degenerating from their genuine Natures.

Some Moderns have likewiſe divided it into Bilious, Sanguine, and Lymphatick. Others will have it that theſe two Principles only, *viz.* *Lympha* and *Gall*, put into Heat and heating the whole Body; and that all Diſeaſes whatſoever owe their Origin to theſe two Principles, eſpecially the latter of which is the principal Agent.

Theſe Diviſions muſt be aboliſhed and reduc'd to ſanguine only; for we are not to believe that ſometimes the *Lympha* alone, ſometimes the *Gall*, *&c.* alone doth putrify, by reaſon of which peculiar Putrefaction, brings on the Fever. For,

It is not neceſſary that the Number of ſpecifically different morbifick Matters, or noxious Humours, ſhould be ſo numerous as that of the Diſeaſes the Blood is obnoxious to; and conſequently that every Diſeaſe, that has a diſtinct Name aſſign'd to it, does not always require a diſtinct

Sort of peccant Matter to produce it, but only the ſame morbifick Agents to produce the diverſify'd Effects, partly by its own greater or leſſer Quantity, and more or leſs active Qualities, and partly (and indeed chiefly) by the particular Natures, or Structures, or Situations of the Parts that it invades: And the Diſeaſes to have their Riſe and Declenſion accordingly.

And the Probability of it may be eaſily deduced from what frequently occurs among ſick Perſons, of the *Metaſtaſis* (or Tranſlation) of morbifick Matters; the ſame noxious Humour for Inſtance, ſometimes occaſions one Diſtemper and ſometimes another, and theſe diverſify'd according as the Humour happens primarily to invade, or afterwards to be tranſlated to, this or that particular Part of the Body.

Hence, proceeds at the *Criſe* only, that inſtantaneous Concoction, Separation, and Expulſion of the morbifick Matter, becauſe we allow of Blood only, that is one Humour, to ſtagnate and putrify. For we don't ſuppoſe that the whole Maſs of Blood can be corrupted, all at once, only the Part out of the Force of Circulation: But muſt allow that there may be a Vitiation or Depravation of the whole, in chronical and malignant Diſeaſes.

The Uncertainty of the Declenſion and Criſis of a continual Fever is ſuch! that though we conſider all the Variety of Circumſtances, all its concomitant Symptoms, nay ſeemingly remove all the general Cauſes of Fevers: By diminiſhing the *Plethora*, opening all the Avenues of the Body, promoting all the natural Diſcharges, allaying all the Acrimony of the Humours: Yet there remains ſome peccant Matter, which is the *Fomes*: For no Fever doth vaniſh or finally ceaſe; but that ſome of the noxious Humour, is carried off by Urine, and ſubſides to the Bottom of the Veſſel.

I muſt confeſs that I'm of Opinion that it cannot be deem'd reaſonable or poſſible that we ſhould arrive at any Certainty when the Fever will come to a Criſis. For,

Tho' we preſcribe the moſt attenuating, ſtimulating, and propelling Medicines, yet this remains in the capillary Veſſels or the ſecretory Glands; 'till in its proper time, it has undergone that inteſtine Change; and fitted to paſs through the Orifices of the ſecretory Veſſels, to be excern'd by Urine, Stool, Perſpiration or Sputation. And,

This ſame peccant Matter requires different time to concoct, according to the the different Tenacity or Lentor of the Fluid, and the different Degrees of Heat, *&c.* So that a Judgment can't be form'd by any Rule, when we are to expect a *Criſe*, but we are obliged to wait with Patience, and in the mean time, aſſiſting Nature by leſſening the Quantity of ſuperfluous Humours, when ready to ſink under its Burden, to re-enforce the Efforts of the Conſtitution. To come therefore to the Point.

The Humours that ſtagnate and putrify in Fevers, may be ſometimes the ſerous, and at other times the grumous Part of the Blood; the former in continual Fevers, and the latter in intermitting. Theſe are two diſtinct Fluids in a living Body, as appears by microſcopical Obſervations; and upon Phlebotomy ſeparates in the Baſon into two different Parts.

The moſt effectual Cauſe of continual Fevers, is an Obſtruction of the Glands; and the immediate Cauſe of intermitting Fevers, is an Obſtruction of the capillary Arteries; and theſe are the Fluids that occupy and poſſeſs the ſanguinary Veſſels;

and paſs and re-paſs through thoſe ſpiral and contorted Channels; and when they are impeded in their Circuit are the Cauſes of putrid Fevers. For all the other Combinations, which form ſo many diſtinct Fluids, as Bile, Sperm, *&c.* are not immediately concern'd as Agents in producing Fevers.

Thoſe that do imagine that the Gall is the principal Agent, and the Cauſe of Fevers and of moſt Diſeaſes; it is highly neceſſary that they ſhould have it carefully and judiciouſly analyſed; that they may be well acquainted with its conſtituent Principles, (whence proceed different Qualities) and having found out its Nature, they will be better able to encounter ſuch a potent Enemy, by applying ſuch Medicines as will qualify thoſe inimical Sulphurs or Salts of whatever kind they are pleaſed to call them.

We all know that the Gall is diſcharged into the *Duodenum* by the *Ductus Cholodochus Communis*, whoſe Uſe is to precipitate the Feculencies, and to blunt the Acids of the Chyle, and carry it out at the Back-door of the Body: For this appears from what *Leeuenhoek* has obſerv'd, that of the great Quantity of acid Salts he has ſeen amongſt the Aliments in the Stomach, he never could find any in the Chyle after it had paſs'd the *Duodenum.*

To defame this notable Part of the vital Machine, as the Cauſe of moſt Diſeaſes, is in ſome Meaſure to reflect upon the Author and wiſe Director of Nature: For one might think the Body might have been contriv'd better, than that ſuch an Enemy ſhould be placed in ſo inward a Receſs, at Liberty to diſgorge its Venom into the nutritious Juice. Yet I muſt confeſs (without Partiality) that this ſame Principle is the Cauſe of great Diſorders *, by an Obſtruction of the excretory Veſſels of the Liver, by being detained too long in its Diſcharge out of the Guts, and if——admitted with the Chyle into the *Venæ Lacteæ*, &c. So that if it be detain'd in the Guts, the Conſequences are diſmal; yet if any Quantity paſs downwards, a *Diarrhœa* enſues. 'Tis diſmal indeed, that whether it ſtay or go, its morbous Effects are inevitable.

As to the real Cauſes of Fevers, whether they proceed from an Augmentation, Diminution, or Depravation of the Blood, is not to the Purpoſe, except the latter; for the two former are accounted for with ſuch Exactneſs and Accuracy, by the Rules of Mechaniſm and Laws of Motion, that the Subject is exhauſted; and the Author † deſerves no leſs than an univerſal Applauſe, even of his very Enemies.

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* -------- morbos producit varios, nauſeas, anxietates, ſingultus, cardialgias, vomitus, dolores iliacos, colicos, tormina, diarrhœas, dyſenterias, morbos acutos, febres, convulſiones. H. Boerhaave Inſtit. pag. 158.

† Dr. *Cheyne*'s New Theory of Fevers.

The great *Bellini* has laid the *Cauſa conjuncta* of Intermittents in a Lentor, that doth accumulate in the capillary Veſſels. And Dr. *Jones*'s Book, *de Febribus intermittentibus*, and Dr. *Quincy*, in his Tranſlation of *Sanctorius*'s *Medicina Statica*, agree as to the immediate Cauſe of an intermitting Fever or Ague; ſo that an Ague is a Diſeaſe from Thickneſs of Blood ſtagnating in the capillary Arteries, having acquired a vitiated, putrid and pungent Quality *, is diſcharged into the Maſs, there *ipſo facto*, doth conſtitute a Fever; by ſtimulating and vellicating the tender Fibrils, thereby hurry and exagitate the circling Fluid, till the heterogeneous Matter is carried off by Urine, Stool, or Perſpiration.

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* Primroſe de febrib. pag. 98. ex Hugon. Senenſ. Harum verò febrium materia putreſcebat intra venas, antequam expelleretur. Vid. Primroſe de paroxyſmis febrium, lib. de vulg. Error. pag. 211.

Cauſa eſt fermentum febrile ſive humor corruptus vel putridus in partis alicujus ſolidæ tubulo collectus. Waldſchmidt. Tom. 1. pag. 328.

What ſeems moſt ſtrange to ſome, is, that the Matter of every *Paroxyſm* ſhould be generated *de novo*; and that becauſe as ſoon as every *Paroxyſm* is ended, the very Eſſence of the Fever ceaſes for a time, and the Blood returns to an *Apyrexy*, every new *Paroxyſm* would be a new Fever, which can no way be granted by 'em.

But all this ſeems very reaſonable as long as the *Cauſa cauſæ*, or the antecedent Cauſe remains, that is, the Relaxation of the Solids, or whatever elſe retards the Motion of the Blood, to enlarge the Globules, ſo as to make a Size that will not paſs ſome ſmall Veſſels, or other, and that ſtop more; and being thus ſtagnated, corrupts and gets a peregrine Ferment, and either produce ſome topical Malady, or excite ſome diſorderly Fermentation in the Blood, in proportion to what ſtagnates.

So that there is required only a Stagnation of good Blood in the Capillaries to generate a Fever every Day a-new: Moreover double or treble *Quotidians*; as when the ſame Day two or three *Paroxyſms* invade the Patient ſucceſſively. In ſhort, all theſe irregular *Paroxyſms* are occaſioned by different Fermentations, (if I may ſo call it) being not of the ſame Date, the Stagnation taking not its Riſe from the ſame time, therefore the partial Concoction muſt be ſooner or later.

Hence it is that altho' the Blood, after every *Paroxyſm*, is entirely brought to right, yet if the Relaxation of the Solids remains, ſo that the protruding Force is not equal to the Reſiſtances of the Fluids, there will be a Renewal of the Viſcidity, ſufficient to bring on another Fit; for Fluids cannot move on, unleſs the impelling Forces conquer the Reſiſtances. What I have hinted is ſufficient in order to proceed with the *Cortex.*

Dr. *Sydenham* has given us an Account how the *Cortex Peruvianus* firſt became famous at *London* for curing Agues, and eſpecially *Quartans*; and indeed for very good Reaſon, ſeeing theſe Diſeaſes were rarely cured before by any other Method or Medicine, wherefore they were called *Opprobria Medicorum*, and were truly a Reproach to Phyſicians.

It was at that time analytically accounted for by very good Hands, yet being ignorant of the Nature of the Blood which is the Seat of the Diſeaſe, it always operated by an occult Quality: But at this time being partly let into the Secret of the Tranſmutation of Blood, its Operation will be no longer a Myſtery.

It is true indeed, that there is no Remedy known in this Caſe like the Bark; for it is declared to be extremely bitter, reſinous, viſcous, and conſequently a moſt potent Styptick; and in regard all theſe Qualifications, Figures, Poſitions and Principles do ſo rarely concur in one Body, it is no Wonder not many Barks, Roots, *&c.* will hardly reach to a *Succedaneum*; yet being acquainted with the Nature of the Blood, will furniſh us with a Guide eaſy to conduct us to find out ſome more of the ſame Claſs of Medicines that will anſwer the ſame Intentions, and equal to *Riverius* his *Febrifuge* or the Bark.

The *Cortex per ſe* operates neither by Vomit, Stool, Urine, or Sweat, being the uſual way of carrying off the Cauſes of Agues. I judge we may ſafely conclude, its chief Energy conſiſts in * ſtopping Ague Fits (tho' at the ſame time it mends the Stomach and corroborates the whole animal Syſtem) which is confirmed by one large Doſe only, taken about an Hour before the Return of the Fit: For if a Doſe as large as the Stomach could bear, was taken after the Ferment is commenced in the Maſs of Blood, it will not in the leaſt quell the Hurry, but will prolong the Fit, by preventing the Expulſion of the heterogeneous Particles.

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* Cortex Peruvianus, non tantùm ad paroxyſmos tollendos, ſed & ad diatheſin emendandam, cauſas excitantes fruſtrandas & coctionem maturandam, *&c.* Jones de febr. intermitt.

Therefore it is an Error to imagine that the *Cortex* cures Fevers by putting a Stop to the Ferment; for a Doſe not well timed will exaſperate the Fever, as I have often been an Eye-Witneſs.

Hence it is evident that this wonderful Effect proceeds from penning up the Humours, and preventing the Eruption of the obſtructed morbid Matter into Action till it comes to a perfect Concoction or Suppuration; thereby the Load is extirpated, and the Solids and Fluids *in Æquilibrio.*

And this we not only deduce by Reaſoning, but can evince by ocular Demonſtration: For it plainly appears by the Urine of Intermittents, during the Intermiſſion of the *Febrile Paroxyſm* *, it has a lateritious Sediment which is a ſign of a partial Concoction: And after taking a ſufficient Quantity of the *Cortex*, you'll find a light, white, and equal Sediment, which always hath been obſerv'd to ſignify a perfect Concoction of the Humours: And then it is carried off by the aforeſaid Sluices or *Emunctories*, without any Commotion, according to the Aphoriſm of *Hippocrates*, *Dum pus conficitur, dolores ac febres accidunt: purè autem confecto ſedantur.*

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* In paroxyſmis febrilibus urina miſſa plerunque ſanis videtur ſimilis. Nam tunc natura cum peccante materia effervеſcente pugnat, & nihil ad veſicam ſegregat; intermittente verò die natura minùs à cauſa morbifica laceſſitur & poſtquam victoriam obtinuit, victos humores ad loca excretioni deſtinata oblegat; & tunc urina Putredinis indicia ſatis evidentia exhibet. Hercul. Med.

The Pain and Fever proceed from the Stagnation and Expanſion of the Veſſels, and from the Acrimony of the obſtructed Humours: But when concocted and diſcharged, the Veſſels recover their eaſy Tone, the Fever ceaſes, and the morbid Matter is carried off without offering Violence, from a new Concentration of Parts. For as the Alteration in the Texture of a Subſtance brings a manifeſt Change in the Qualities, ſo a Change in the Qualities proves an Alteration in the Texture.

And here it may not be improper to obſerve, that when the Blood ſtagnates *intra vaſa*, and acquires acrimonious pungent Qualities, it vellicates the *Vaſa* or ſolid Parts; ſo that they (like drowned Flies revived by the ſolar Heat) begin to actuate and recover their Elaſticity, and ſo diſlodge and throw off the morbifick and heterogeneous Matter, before a compleat Suppuration: But if aſſiſted by Art to retain it ſometime longer, there will appear in the Urine a perfect Concoction.

But when it ſtagnates *extra vaſa*, it is generally retain'd till it comes to a compleat Suppuration; as it hath been many times obſerv'd, that in an *Empyema* (which proceeds from laudable Blood, ſtagnated and turned into Matter perforating the Membrane, and diſcharged into the *Thorax*) the purulent Collection hath been evacuated ſometimes by Stool, but more commonly by Urine *; ſo that the extravaſated Matter is admitted into the Veſſels, and by Circulation paſſed down.

The Nature and Manner of the Operation of this celebrated Drug † is not rightly underſtood; for moſt, if not all, declare after a doubtful manner. One will have it to be a great Abſorbent, and withal ſtyptick, and a potent Aſtringent, which are Qualities inconſiſtent at the ſame time in the ſame Body.

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* Zacut. Lucitan. de Suppuratione Obſervatio, 119. Scultetus in Armament. Chir. Obſerv. lib. item Obſerv. 46. Fabrit. Hildan. Obſerv. Skenkius, *Felix Wurts* in his Surgery, in the Chapter of Wounds in the Breaſt. And *Belloſte* Le Chyrurgien D'Hôpital.

† Cort. Peruv.

Another will have it, that it works a Cure by thinning the Blood, by new bracing up the fibrous Syſtem with its Aſtringency, and by opening inſenſible Perſpiration. And,

The third ſays, that it is an Alcali, becauſe Alcalies diſſolve the Blood, and Acids coagulate it: And for farther Confirmation tells us, that all Bitters (conſequently the *Cortex* being likewiſe a Bitter) do attenuate the viſcid Particles, by diſſolving the Bond that links them, that is the Acid it deſtroys; for it is ſuppoſed that they do conſiſt of fixt alcaline Salt, and this Salt is *ex diametro* oppoſite to the Effects of Acids.

In ſhort, they are of Opinion that the *Cortex* keeps the Blood from Coagulation, and renders the Fluids uniform,

form, and has the ſame Effects on the Fluids as teſtatious Powders have on Vinegar.

But we have the Authority of that noble Philoſopher Mr. *Boyle*, who aſſerts that there are no lixivial Salts, or urinous, *in rerum naturâ*, unleſs produced by Putrefaction or Fire; (neither of which can be ſuppoſed to have broke the Texture of good Bark) For the fixt Salts of Vegetables, prepared by Calcination, were not naturally pre-exiſtent in that Form, but are produced of the volatile Salts colliquated amongſt themſelves, and with the earthy Particles by the Force of the Fire.

But it is paſt all doubt, foraſmuch as Experience has confirmed to us, that ſtyptick Medicaments are the chief Profligators of all intermitting and periodical Diſeaſes.

There are ſome who will not have the *Cortex* call'd a febrifuge Medicine, but rather attenuating or aperient,

rient, becauſe it is ſuited to a Diſeaſe produc'd by a Lentor or Viſcidity. The Implication then is (*expertus loquor*) that it is not ſtyptick and aſtringent, for they are jealous very pernicious Effects would enſue.

And although it is thought to have thoſe wonderful Effects by its being a powerful Diſſolvent, yet do lay to its Charge, that it occaſions Obſtructions and Tumours, ill Habits of Body, Dropſies, Suppreſſion of the *Menſtrua* in Women, *&c.* all which Deobſtruents are never charged with; and whenever this happens by the *Cortex*, it is occaſioned by *mala Praxis.*

But we find that the ſame Medicine will do Wonders in a thouſand Diſeaſes that are Periodical * or where the Solids are relax'd, and want a potent Aſtringent, that will brace the Fibres, preſerve the *Æquilibrium* between

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* Omnium intermittentium fermentum eſt ejuſdem generis. Morton. Pyretolog.

tween the Force of the Solids and the Reſiſtances of the Fluids.

By what has been ſaid, it will be a hard Matter to bring them to aſſent, that the *Cortex* doth Wonders by accelerating of Putrefaction. And it may be thought unreaſonable to induce and accelerate Putrefaction, in order to ſet the OEconomy to rights, ſince Putrefaction is the Deſtruction of a Body: But I mean no other than that which has acquir'd a preternatural Craſis, Diſpoſition or Quality, and is as much excrementitious as the Urine, or *Alvi Fœces*, as being incapable of being aſſimilated into the univerſal Maſs *.

We have no leſs a Man than Dr. *Morton*, who tells us, in his *Signa Febris intermittentis diagnoſtica*, that he obſerv'd, that when the Urine had a lateritious *Hypoſtaſis*, as it is wont to have in intermitting Fevers, though in a Colick of the Stomach, or Inteſtines, Pleuriſy, Rheumatiſm, Scarlet Fever, *&c. China-Chinâ citò ſemper, & feliciter curare ſoleo.*

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* Fernelius, lib. 4. Pathol. cap. 5. Sed & omnes fatentur Sanguinem tam magna interdum mutatione depravari, ut non amplius ad habitum redeat naturalem, nec poſſit iterum per naturæ concoctionem ad primam humoris bonitatem redire.

To make it ſtill more clear and concluſive, *Bates's Pulvis Lateralis*, which is *Glans Quercina*, &c. And of the ſame Claſs is recommended, in *Iliaca, Colica, Lateris dolore, Flatu, Podagra, &c.* This Medicine cannot be proper in theſe Caſes, unleſs it is taken when there is a lateritious Sediment, and previous Evacuations ſpecificated to the Caſe; to diminiſh the *Plethora ad Vaſa*, or what is equal to this, until the Humours have been pretty well ſpent in Evacuations (as uſual when People have been ill for ſome time) and the *Plethora* much leſſened; then in either of the aforementioned Caſes, a Medicine that has theſe Qualities, will immediately put a Period to the Diſtemper.

Ex hâc regulâ generali, nil incommodi.

We find that Aloes and Steel it ſelf, though they have an aſtringent and ſtyptick Quality, are placed in the Claſs of Deobſtruents: Undoubtedly their Energy is in corroborating, or a Coarctation of the *Vaſa*, or ſolid Parts to embrace the circling Fluid, and this in Conjunction with a *Stimulus* or vellicating Quality; whereby they give a greater Momentum to the Blood, and increaſe the Attrition and Impulſus of its Parts one againſt another, ſo that the Blood is render'd more fluid.

I would not be thought to decry or leſſen the juſt Character and Reputation that *Chalybeats* bear and well deſerve; but rather the contrary: For what cauſes me to be ſo inquiſitive about the manner of Operation of theſe Medicines (Aloes and Steel) is becauſe they are what take place of all others in the laſt Stages of theſe Diſtempers herein mentioned; the one to drain the Surcharge of Humours, and by the Aſſiſtance of the other, to reſtore a decay'd impoveriſh'd Blood, and to fortify the Solids of the whole Body.

Although Aloes is ſuch a glutinous, viſcous, emplaſtick, and a potent Aſtringent externally, (which makes it of ſo great Eſteem among our Surgeons to prevent an *Hyperſarcoſis* or *Fungus's*) yet internally it becomes a Purgative, and it's thought to attenuate and exceſſively diſſolve; becauſe its frequent Uſe raiſes a ſmart Ebullition in the Blood, ſo as to force it out of its Channels, by opening the Hemorroidal Veins, and other Veins and Arteries. But it is much that it ſhould not retain a little of the ſame Quality, and operate accordingly, when taken into the Body *.

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* Aloë vero mixtæ cujuſdem facultatis eſt, ſicut & roſa: ineſt enim illis quædam amaritudo quâ extergunt, ineſt & adſtrictio, quâ unire poſſunt, & ad cicatricem perducere. Lib. Fuchſii. pag. 134.

Galen makes Aloes a principal Ingredient of his *Pulvis aſtringens*: And we find that the learned and worthy Phyſicians among us preſcribe *Tinctura ſacra* in old Agues, (that have eluded the Force of the Bark) whoſe principal Ingredient is Aloes. So when the Efforts of the Conſtitution are not able to bring the peccant Matter to a Head or throw it off; then Evacuation by Stool † is promoted both to eaſe the Conſtitution of the over-load, and carry off the Humours that would otherwiſe incommode the Organs in performing their Offices.

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† Petrus Monavius, apud Crat. lib. 2. pag. 417. Si inquit, in febribus intermittentibus quibuſcunque, apparente aliquâ, etiam non perfecta, in urinis coctionis, Ægro ipſo die paroxyſmi medicamentum purgans dederis, ita, ut effectum ſuum ante paroxyſmi invaſionem compleat (horis ſcil. quatuor, aut quinque antequam paroxyſmum adventurum putas) videbis, febrim poſt illum paroxyſmum non ampliùs reverti, ſed prorſus tolli, quaſi incantatione quadam probavi jam ſæpius, & in pluribus ſemper eventus reſpondit.

Vid. Sennert. lib. 2. Pract. pag. 106. ex Tralliano & Galeno. Jonſtonus lib. 7. pag. 337. Riverius Pr. l. poſt. pag. 599. ex Arculani, Gentilis, & Amati Lucitani Sententia.

Moreover this Medicine purges off thoſe viſcous and putrid Humours in a great Part, the Remainder is fitted and prepared for Expulſion, by reſtoring the Contraction, and due Oſcillation of the Solids, and the internal Motion of the Fluids, *&c.* Which Properties ought to concur in any Medicine, that deſerves to be named a Febrifuge, or a ſpecifick Antipyretick.

And *intercalato die*, *Sal. Abſynthii* and *Succus Limonum*; theſe through their mutual Re-action ſo elaborated, that in this conjunct State have aſſumed neuter Faculties, not to be deprehended in either ſingular: It aſſiſts greatly in Digeſtion, by aſtringing and hardening the Fibres, and cauſing an agreeable Senſation on the Stomach; ſo that our Aliments are tranſmuted in ſuch manner as is proper for each Digeſtion: And moreover deterges the Humours in the ſmalleſt Veſſels, and ſo fits them for ſome Evacuation. Thus we find one, two, or three things, though indifferent in themſelves, ſhall, when blended together, produce a valuable Effect.

And Veſicatories to brace the Fibres and wear off thoſe ſluggiſh Humours through the perſpirable Orifices: For Fluids grow viſcid and ſtagnate thro' the decayed Contractions of the Solids, and may therefore then want a *Stimulus*.

Several have been cured of Agues by taking *Spir. Sal. Armon. Semin. Sinap. Flor. Sulphur. &c.* Theſe by taking off the *Lentor*, or Viſcidity of the Blood; others by Contraction of the Veſſels, and Suppuration and Precipitation of the Humours. And we ſee Perſons frequently cured by Frights, or great Strength of Imagination upon pretended * Amulets, Periapts,

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* Fernel. de abdit. rerum cauſis, l. 2. c. 16. Abr. Seiler. apud Crat. l. 3. Epiſt. pag. 396. Foreſt. l. 9. obſ. 52. in Schol. tot. Horſt. Oper. Tom. 3. pag. 110.

Charms, and the like Remedies; which having no Virtue in themſelves to produce ſuch an Effect, the ſame muſt be referred to ſome other Cauſe.

Now none hath more Empire than the * Imagination over the Humours, wherein almoſt all Diſeaſes conſiſt: For the nervous Syſtem has a peculiar Faculty to exert it ſelf more and more, as often as the *Imperium Voluntatis*, the *Fiat* of the Will ſets it upon Motion.

In like manner the Imagination having Dominion over the Humours, which it moves by Mediation of the nervous Syſtem, as Joy, Shame, and Anger bring Blood and Heat into the Face and outward Parts; and Fear and Sadneſs give them a contrary Motion; (that is, the Blood is but languidly propell'd through the capillary Veſſels) as it draws up or ſlakens the Fibres, or as it gives a quite contrary Modification to the Solids, they are always attended with the oppoſite Conſequences. It appears that it hath Power to produce Maladies of Intemperies with Matter by the Fluxion or Congeſtion of the Humours into ſome Part, and out of their natural Seat.

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* Cicer. Epiſt. 28. ad Tyronem ------ Nunc opus eſt, te animo valere ut corpore poſſis.

For if the Fancy can diſorder the Work of Conformation in any other Body than its own (as that of an Infant, whoſe Marks and Defects wherewith he is born are the Effects of the Mother's Fancy) much more may it cauſe the ſame Diſorder in its own Body, whereunto it is more nearly conjoined. Wherefore ſince it can deſtroy the Temper of the ſimilar Parts and the Harmony of the Organs, it may alſo cauſe Diſeaſes, and by the ſame Means cure them too.

It is manifeſt how Aſtringents cure Diſeaſes external as well as internal; and in order to aſſign a proper Reaſon for the Uſe of thoſe Medicines, we may conſider in a *Herpes Simplex*, Aſtringents cannot contribute to the Cure by promoting Maturation; yet by their conſtrictive Parts they contract the Veſſels, and corrugate the Skin, they do by that Means prevent the farther Influx of Humours, and conſequently that already contain'd is the ſooner digeſted and diſcharged.

Whenever ſuch Separations appear upon the Skin, without any ill Diſſpoſition, as *Vitiligo*, *Pruritus*, *Pſora*, *Elephantaſis*, *&c*: Is is plain that they indicate no farther (being indifferent as to the Health of the Body) than to be deſtroy'd or removed in the Part: For Internals very often prove tedious and ineffectual; therefore for a ſpeedy eaſy Cure a local Application.

External Applications or Topicks may not be proper in all Caſes, tho' even at this time a-day a great Part of the World, *viz.* *China* and *Japan* lay their chief Streſs and Undertaking to cure almoſt all Diſtempers by *Acupuncture* and *Inuſtion.*

I ſhall here only inſtance an *Eryſipelas,* and the ill Conſequence of applying ſuch things as repel, or drive the Humour from the outward Parts to the inward, and that it muſt be contrarywiſe from the Centre to the Circumference, as *Hippocrates* hath taught us, *Lib.* 6. *Aphor.* 25. in order to remove and make a Cure.

The firſt Scope conſiſteth in the right Obſervation of good Regimen or Diet. The ſecond concerneth the Averſion of the Humour flowing to the affected Part, which is called *antecedens Materia.* The third conſiſteth in diſcharging the Humour which hath flowed already into the diſeaſed Part, which is called *Materia conjuncta*; and that by ſuch Medicines as have a diſſolving and breathing Quality.

There are many both Simples and Compounds, rehearſed of *Paulus Ægineta,*

neta, *lib.* 4. *cap.* 21. and of *Ætius*, *lib.* 14. *de re medica.* And *Galen* hath commanded, to ſprinkle the Part abundantly with hot Water: By this we are to underſtand that it is always good when any internal noxious Humours break out, that they may be evacuated by Perſpiration or Suppuration; for if external Humours ſtrike in, they may injure ſome or other of the principal *Viſcera*, and endanger the animal Functions.

But we have the Authority of the learned Dr. *Friend*, who tells us * that it is a vulgar Notion, that an Eruption upon the Skin forbids Bleeding, for he has preſcribed it with good Succeſs in an Eryſipelas, Small Pox, Meaſles, Scarlet-Fever, *&c.* And,

That excellent practical Phyſician Dr. *Sydenham* preſcribes an emollient, diſcutient and diaphoretick Fomentation, in order to give vent, and diſcuſs the impacted Matter. And

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* Hiſt. of Phiſ. vol. 1. pag. 75.

ſince that judicious Phyſician treated this acute Diſeaſe with Phlebotomy and Purging premiſed; undoubtedly we may with a great deal of Safety make uſe of Externals in Diſeaſes of the Skin which are chronical, and they eaſily yield to and vaniſh: For the Fault may be in the Solids, and therefore ſooner removed by local Application.

I have this only to add, and that is, an experienced Remedy in a Vitiligo, or Morphew, a Diſtemper ſo common, and it is this,

℞ *Sapon. Alb.* ℥ i.
Sulphur. Viv. ℥ ſs.
Virid. Æris ʒ ſs.
Camph. (S. V. Solut.) ℈ i.
Ol. Tart. p. deliq. q. ſ.
M. F. Globulus.

Moiſten it in a little Vinegar, and rub the Part affected with it at going to reſt, till ſome adheres to the Part;

the Morning following to waſh it off with warm Water, and this repeated once or twice will compleat a Cure. Yet do not think it amiſs to make uſe of Internals, (though this alone ſeldom or never fails) ſuch as Æthiops Mineral, or the like, to diſſolve and deterge the ſizy Juices of the ſmalleſt internal Glands, and of the cutaneous excretory Ducts, for fear of a Relapſe.

The Putrefaction of the Body of Man (as in Agues, Conſumptions of the Lungs, Impoſthumes, and Ulcers both inwards and outwards) is owing to a want of a due Circulation; and all Tumours, Puſtules, and Diſcolourations are occaſioned by Blood ſtagnating in the Hollow of the Fibres, which becomes groſs and thick, and is incapable of paſſing into the capillary Veins, yet notwithſtanding the Pulſation of the Arteries propelling it forward, muſt neceſſarily then elevate the Blood ſtagnating in the Fibres into a Tumour, Puſtule, or Diſcolouration, according to the Proportion of what doth ſtagnate.

This naturally leads me to ſay ſomething concerning puſtulous Eruptions, eſpecially thoſe of the Small-Pox, (a Diſtemper ſo unaccountable to moſt Phyſicians) the *Seminium* of which is thought to lodge in the Blood of ſuch as never had them; and of ſuch peculiar Nature it is, that few are twice attack'd with it. But whether it is an endemial Diſeaſe that is impreſſed by a particular Conſtitution or Intemperature of the Air, or whether it proceeds from a latent Cauſe lodged in the primogenial Temperament, which Nature doth caſt forth into thoſe virulent Puſtules; I ſhall not determine.

However it is a receiv'd Opinion, importing that thoſe that are inoculated for the ſaid Diſtemper, are never after ſurprized with it. But as to the Manner how it is produced by Inoculation; the Reaſon is obvious, and contained in this Maxim, *Pus generat Pus*, Matter begets Matter.

I have in the foregoing Sheets demonſtrated how the Blood of its ſelf innoxious is changed into an heterogenous Matter: And it is certain in this Operation, that the malignant Particles being diffuſed thro' the Maſs, and thus communicated from without, do nevertheleſs render it prolifick; being convey'd (by the Laws of Circulation) to the ſecretory *Ducts*, eſpecially the cutaneous, by reaſon of the great Diſcharge of Humours by Perſpiration, there forming *Puſtules* by coagulating the Blood coming thither or paſſing that way, according to the Texture of its Parts. But how certain or how advantageous this may be in preventing the like Diſtemper from any other Cauſe, I ſhall leave it to the Obſervations and Reaſoning of others.

In acute Diſeaſes that proceed from a Suppreſſion of ſome Secretion, there will be a *Plethora morboſa*, which is the *Cauſa antecedens proxima*; ſo that when we find Nature thus embaraſſed, and cannot be rid of this Load by its uſual ſecretory *Ducts*; we muſt endeavour by a regular Procedure to nip them in the Bud, by diminiſhing and taking off the *Plethora*; for it is plain, that the Quantity drawn off, if it be in time, does the Buſineſs, by reſtoring again the *Æquilibrium*, between the Solids and the Fluids.

In Caſe this ſhould be omitted thro' Neglect, we muſt endeavour to prepare the Humours that ſtagnate in order to correſpond with the Orifices of the excretory Veſſels; that the Humours which cannot be aſſimilated into homogenous Qualities, might be thrown out of the Courſe of Circulation by the natural Diſcharges, by Tranſpiration, or by

Abſceſſes; and the animal Fluids reſtored to their natural State.

For if the glutinous and viſcid Humours cannot be alter'd and concocted into a due Magnitude or Smallneſs, as that they may be carried by the Laws of Circulation through the Channels of Excretion, they muſt either ſtagnate in the capillary Veſſels, or there will be a *Metaſtaſis* at leaſt into the cutaneous Glands, and capillary Veſſels; and being there retained are either formed into Abſceſſes, or taken off by ſome Hemorrhage; and this is what we call *Criſis*.

A *Criſis* is commonly defin'd a Mutation of a Diſeaſe either to Health or Death, for better or for worſe, or the Change of one Diſeaſe into another. The Term thro' which it paſſes is the Space of Time employed by Nature in the Coction, Separation, and Excretion of the peccant Humours. The Agent or

Motor is Nature, which muſt be aſſiſted in imperfect *Criſis*, not in ſuch as are perfectly made. No laudable *Criſis* happening without Concoction precedent, which holds good not only in continual Fevers, but alſo after the Fits or Acceſſions of intermitting ones: Laſtly, we muſt conſider what is moved, namely, the Humours; for *Criſis* hath place only in humoral Diſeaſes.

Criſis morbi eſt coctio materiæ morbificæ & humoris excernendi.

A
DISSERTATION
OF THE
OPERATIONS
OF
CHALYBEAT MEDICINES
IN
HUMAN BODIES:

In Oppoſition to the receiv'd Opinion of their operating by their *Pondus*, *&c.* Founded upon experimental Obſervations and demonſtrable Principles, the ſole Original and Fundamental of true Knowledge, which our Senſes are Witneſs to.

Veniet tempus, quo iſta quæ nunc latent, in lucem dies extrahet, & longioris ævi diligentia. Senec. Nat. Quæſt. l. 7. c. 25.

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THE

PREFACE.

I *Muſt advertiſe the Reader, that the Reaſon of my ſubjoining this Diſſertation by way of Appendix, is becauſe I thought it too great a Digreſſion from the Subject of the foregoing Eſſay, to add to Page* 170, *where I have hinted the Nature and Manner of the Operation of Chalybeat Medicines in human Bodies; but here I ſhall be more particular, in order to prove manifeſtly how erroneous the generally obtaining Opinion about their operating by their* Pondus, *&c. is, and that by experimental Obſervations and demonſtrable Principles.*

It may juſtly ſeem a Wonder that a Diſſertation of this Nature ſhould appear at this time a-day, after the late learned Dr. Friend's Prælectiones Chymicæ, *and Dr.* Quincy's Prælectiones Pharmaceuticæ; *wherein Pharmacy, chymical and galenical are brought near to the* Acme *of Perfection.*

Notwithſtanding Dr. Quincy's *critical Genius in Pharmacy and Chymiſtry, that nothing ſcarce eſcaped his Knowledge, inſomuch that he has accurately diſcover'd to us the Virtues, Uſes, and Doſes of medicinal Drugs and Simples; and proper ways of compounding and decompounding,* &c.

But the Explication of the Manner of the Operation of Chalybeat Medicines in human Bodies is grounded upon falſe Principles, and not Matters of Fact; to wit, that all Chalybeat Preparations, in a liquid Form, owe their medicinal Efficacy, to the Metal diſſolv'd, whether in an aqueous or ſpirituous Menſtruum,

ſtruum; *retaining its metalline Texture and Properties.*

This might proceed out from an over-fond Opinion, and undoubted Authority, of what had been advanced upon that Head by the Gentlemen of the firſt Claſs; and tho' ingeniouſly handled according to the Newtonian *Philoſophy, and being not founded upon the Baſis of Nature, muſt of Neceſſity fall to the Ground.*

The Principles and Method of Reaſoning, introduced by Sir Iſaac Newton, *and happily applied by others to the animal Structure and Medicine, teaches us to account how Medicines operate by their mechanical Properties. Hence it is that our* Rationale's *are ſeldom leſs than demonſtrable, and when it happens otherwiſe, it is becauſe we draw our Concluſions from falſe Principles.*

That the Manner of the Operation of Chlaybeat Medicines in Human Bodies, ſhould no longer remain in obſcurity

ſcurity, I have in the following Diſſertation ſhewn that Mars *or* Iron *cannot get into the Blood retaining its metalline Texture and Properties; and that all other Metals excepting* Mercury *alone may be rejected upon account of their ſpecifick Gravity or any of the Properties reſulting from the Compound: for they are ſuſpended in Liquids in* ſolutis principiis, *(or Principles diſengaged) which have in no wiſe the Properties of the Metal.*

In order therefore to be better enabled to deduce juſt Conſequences, and to prevent for the future ſuch croſs Miſtakes; it is neceſſary to inſpect narrowly into the Properties of Medicines in a liquid Form, as to what Parts or Principles are abſtracted from the Concrete, and ſuſpended in the Fluid; and this is to be accompliſh'd by no other means, than by decompounding, or analyſing the ſame.

Thus we ſhall find the Energies and Manner of the Working of Medicines *in our Bodies, as how they exerciſe their Powers in the firſt Paſſages, and when they have paſs'd the Lacteals and diffuſed through the whole Body, how they operate upon the Solids and Fluids.*

Mercury *and* Mars *lead the Van as powerful Deobſtruents and each upon account of their ſpecifick Gravity. Quick-ſilver when crude (as being ſpherical) opens the obſtructed Veſſels only by the Momentum of its Gravity, procuring a greater Impulſe againſt the Obſtacle, than before ſubſiſted in the moving Fluid; but when its Globules are armed with the ſaline* Spiculæ *it acts in a double Capacity, that is, by its Gravity and vellicating Quality.*

But Mars *or* Iron, *is a vitriolick Body and as ſuch admitted into the Blood: Therefore has different Properties and Ways of acting and producing the like Effect, with that of* Mercury *or Quick-ſilver; which muſt be by its bracing and ſtimulating Qualities, and* *not in point of Gravity, but reſults from the Action of vitriolic Salts, cauſing a ſtronger* Ictus *againſt the moving Fluids and the Fluids ſpringing back again; by this mutual Re-action the Blood is propell'd and hurried along with a greater Velocity,* &c.

Neither of theſe Medicines have any primary attenuating Power, but rather the Contrary: What is done is only by the Attrition of the Parts of the Blood, from its Moment being increaſed, which they will as certainly do, as that they are taken into the Body, and that by a conſtant and immutable Rule of acting, and they would as certainly produce always the like Effect, if they always met with the ſame Diſpoſition of Body.

But it is requiſite to ſeek out ſome other way than Phyſicians have hitherto pitch'd on, to explicate the Manner of Operation of Chalybeat Medicines, *and not content ourſelves to ſay in general, that they operate by their* Pondus,

dus, *Elaſticity, or edulcorating Qualities, without making more particular and leſs indeterminate Eſtimates of their Gravity when in a liquid Form; and then it may probably hereafter appear to act quite contrary to the receiv'd Opinion.*

In fine, we infer a Similitude of Principles from a Conformity of Actions, and we conclude a Difference in Principles from the Difference of Actions. But we are not to ſubſtitute the ſenſible Operation of a Medicine for the internal Action, attributing to a Thing abſolutely that belongs to it merely per accidens. *A Compariſon may ſerve to prove the Poſſibility of a Cauſe, by making it more intelligible, but it does not eſtabliſh the Truth of it.*

In a Word, ſome Things may be imperfectly handled, and others falſly determin'd: Therefore, I am not for implicit Faith, nor over-reſigning to Authority; my way is to examine before I aſſent, and to preſerve Reaſon *in its juſt Liberties; by this Method we ſpring Evidence and fluſh Conviction; Obſtinacy may withſtand it, but Reaſon cannot.*

A DISSERTATION OF THE OPERATIONS OF *Chalybeat Medicines* IN HUMAN BODIES, &c.

M*ARS* being one of the Capital Medicines, and not leaſt worthy of Notice upon account of its Efficacy in removing Variety of Maladies: Therefore it is of ſome Importance as well as Curioſity, to know whether this indigeſtable Subſtance may not be reduced into ſuch a Form as may not be ejected by Siege, but enter the Cavities, and leſs acceſſible Parts of the Body without Corroſion: And the Manner how the active Parts of *Mars* or *Iron* are diſpoſed and fitted to diſperſe or diffuſe themſelves through Liquors, to be ſuſpended therein, and what thoſe Parts or Principles are, that are capable of Suſpenſion.

And from thence by parity of Reaſon, we may probably infer, and have a right Underſtanding whether its integral Parts (or connate eſſential Principles) can be diſſolv'd by the Liquors of the Body, or, whether or no, it be one or more of the diſengaged Principles conſtituting the Body of *Mars*. Moreover whether any Medium can unite it with the Blood, retaining the ſame ſpecifick Gravity and metalline Texture.

Hydroſtaticks applied to the *Materia Medica*, and the mechanical way of Reaſoning are of great Uſe and not to be rejected: But as to the *Rationale* of *Chalybeats* operating by their *Pondus*, may be juſtly queſtioned and made null and void.

It is to be wiſh'd that the mathematical and mechanical Phyſicians, and modern Philoſophers, would be more cautious in their Demonſtrations, leſt they ſhould draw them from falſe Principles: For the Miſtake of one great Man, makes a publick Miſtake; therefore Conjectures ought to be eſteem'd as Conjectures, and not embraced as Truth, till firſt they are demonſtrated; which if they agree not with the Nature of Body, tho' ever ſo ingenious, are not at all ſolid.

Therefore I ſhall leave theſe conjectural *Hypotheſes*, as of Gravity acting, *&c.* and come to more natural, evident, manifeſt, and ſenſible Principles; for we are to demonſtrate all things by the Principles of Nature, tracing the Origin, Cauſes, and Remedies of all Diſeaſes from the true Agents that have produced them.

I ſhall be very particular and copious, in order to prove manifeſtly how erroneous the generally obtaining Opinion about their operating by their *Pondus*, Elaſticity, or edulcorating Qualities, is, and that by experimental Obſervations and demonſtrable Principles. To proceed,

The current *Rationale* how *Mars* performs ſuch extraordinary Cures:
" Is by the attenuating Power it is
" furniſhed with, and from the Gra-
" vity of its Particles, which being
" (by Computation) ſeven times
" ſpecifically heavier (that is, the
" Gravity in Proportion to the Bulk)
" than any vegetable, acts in Pro-
" portion with a ſtronger Impulſe,
" and by that Means is a more
" powerful Deobſtruent *."

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* Vid. Dr. *Friend*'s Hiſt. of Phyſ. Vol. 1. Pag. 119.
Vid. Dr. *Quincy*'s Lexicon Phyſ. Med.
Mars Pharmacop. Aq. Ferruginia.

Another ſuppoſed Property of *Mars*, " is being an elaſtick Body, " heats the Blood more than any " other Mineral, and by its Elaſticity, the Force of its own Particles in removing Obſtructions, " as well as thoſe of the Blood " increaſe; and therefore it is a " better Deobſtruent than ſome other " Minerals, which have a greater " Gravity. † " And,

Another generally ſuppoſed property of *Mars*, (in all Forms) " is " to edulcorate and reſiſt the Acidity reigning in the Blood."

Theſe are the Sentiments of our Country-men, who are truly Stars of the firſt Magnitude, for their Learning, and exquiſite in their Theories in a mechanical Way: Notwithſtandng ſhall make it appear that thoſe are only chimerical Speculations, and not certain and evident

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† Dr. *Keil* of Animal Secretion, Pag. 129.

Truths; being not founded upon real but imaginary Principles.

We all know that *Mars* cannot get into the Blood, but in a liquid Form; ſo that it muſt be prepared out of the Body, or by Elixation in the *Primæ Viæ*.

It is requiſite I begin with theſe few Preliminaries (*tanquam præcognoſcenda*) and if I ſhall not be able to eſtabliſh them all upon Reaſons irrefutable and cogent, are yet nevertheleſs to be premiſed as Poſtulates or Fundamentals for Introduction and Support of the following Theory about the ſpecifick Gravity, *&c.* of *Mars* in a liquid Form.

The worthy and moſt accurate Mr. *Boyle*, tells us, * that a Mineral Water, which by its Taſte, its Effects, and the Colour it would ſtrike, appeared to be richly impregnated with *Iron*, being carefully by him examined hydroſtatically, did appear very little (if at all) ſenſibly heavier than common Water.

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* Vid. *Boyle* of the Origin and Vertues of Gems. pag. 84, 121, 122.

Another notable Inſtance he has given us, concerning the Gravity of a ferruginous Water: To ſhew that the Liquor is not impregnated with the groſſer Subſtance, but with the finer and more ſpirituous Part of the Mineral, without having the ſpecifick Gravity ſenſibly increas'd: For tho' this Water both by its inky Taſte, by its blackening the Excrements of thoſe that drank it, and by other Signs appear'd to participate richly enough of *Iron*; yet the ferruginous Particles it abounded with, were ſo light and ſpirituous, that not only they would, as he tried, be eaſily loſt, if the Liquor were too negligently ſtopt; but when he came whilſt the Spirits were yet there, (it being newly taken from the Spring it ſelf) to examine it hydroſtatically with very good Scales and much

Diligence, he convinced the *Virtuoſi* that aſſiſted, that this ferruginous Water was very little, if at all, heavier in Specie than other Water, which was brought as common Water to be compared with it, and examined with the ſame Scales and after the ſame Manner.

If we conſider thoſe which are natural or prepared in the Bowels of the Earth, and thoſe which are artificial or prepared by Art, we ſhall have but little Reaſon to think that they operate by their Gravity, *&c.* For,

Qu. 1. Are there not *Chalybeat Waters* (particulary that of *Tunbridge*) that are as light, if not lighter than common Water, even purify'd by Diſtillation? Therefore it cannot be ſuppos'd that they operate by their Gravity, but in common with other Waters.

Qu. 2. Are there not Tinctures according to the Eſtimate or Account given of the ſpecifick Gravity of Liquids, that equiponderate, nay ſuperior in Gravity to *Tinctura Martis Minſichti*, or that of *Glauberi*? Therefore their deobſtruent Power ſhould not be aſcrib'd to their Gravity, ſince thoſe of equal Gravity do not equally anſwer as to Operation.

Qu. 3. Are not mineral Waters impregnated with either a martial, aluminous, or muriatick common Salt, or calcarious Earth, or a Combination of Sulphurs, Salts, and Earth? Therefore it cannot be the Metal * that produces theſe valuable Effects.

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* Corporeæ verò minerales aquæ, magis propriè dictæ, ſunt, quæ ſolidas quidem particulas foſſilium continent, ſed adeò exiguas & parvas, penituſque commixtas ut viſu non ſtatim dignoſcantur, ſed vel arte vel longo temporis tractu ſubſidentes & concreſcentes in ſenſilem collectionem ſive copiam redigantur, ut ſunt fontes ſalſi, ſulphurei, *&c.* & aquæ Chymicæ, in quibus metalla diſſoluta. Vid. Geograph. General. Iſ. Newton, Cap. xvii. Lib. 1. Propoſitio. 11.

Si ſint mineralia imperfecta, vel minus denſa, ut Vitriolum, Sulphur, *&c.* vel etiam Salia, quæ ſua natura facile uniuntur aquis, *&c*, ibid. Prop. 111.

Vid. Sennert. in Epitome naturalis ſcientiæ, p. m. 64. c. 9. de fontibus.

Then as to any primarily attenuating Power *Mars* is endued with, I could never learn by all the Experiments that have been made upon Blood, that it had any, but rather the contrary; that is condenſing and incraſſating, as will appear to thoſe who rightly obſerve all its Actions and Properties; and that all *Chalybeat* Preparations that are called aperitive, are highly aſtringent, ſtyptick, and binding *per ſe*: Yet it doth ſometimes *per accidens*, prove deobſtruent, by crowding Humours, violence of Motion, and a forcible Stream they carry all before them, and ſo become aperitive. Again,

How an elaſtick Body as *Mars*, can exert its Elaſticity or Springineſs, when diluted, ſuſpended, and made a Part of the circulating Fluid. And how it can by this Property alone, agitate and propel the Fluid, and thereby heat it, is beyond my Philoſophy to explain: Unleſs we have

Recourſe to the univerſal Law of Nature, and Attraction; for a Fluid that is ſated with Elaſtic-Particles *, will by their repeated Occurſions and Reſilitions produce this Effect: But this Theory is made void in ſhewing that *Mars* cannot be made a Part of the circulating Fluid, retaining its metalline Texture. And again,

To ſuppoſe or imagine that *Mars* deſtroys the Acidities in the Blood, may probably proceed from hence, *viz.* Becauſe the Spirit of Salt and other Acids will act upon it, and be partly depriv'd of their Acidities, and by reaſon it will ſerve in reviving of *Mercury* (in lieu of calcined Tartar or Pot-Aſhes, which are Alcalies) however mortified and contorted into a thouſand Shapes to re-aſſume its own, and return into its numerical ſelf: For all this, when the Texture is broke and Principles diſengaged, it will not anſwer the ſame Intention, as will plainly appear in the Sequel of this Diſcourſe.

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* Sir *Iſaac Newton*, Propoſ. 23. Book 2.

I ſhall wind up my Arguments to ſeveral Particulars, laying down a Specimen of ſome Experiments and Obſervations of others upon *Chalybeat Waters*, with Reflections thereon; drawing from thence a very natural Concluſion.

" Dr. *Moulin* * was encouraged by " the Faculty to make ſeveral Trials " of the mineral Waters at *Paſſy* " near *Paris*, that their Virtues might " be better known. He went about " it in the following manner: Phi- " loſophers diſtinguiſh three Sorts of " Demonſtrations. The firſt which " proves the Effect by the Cauſe: " The ſecond, which proves either " the Nature, or one Property from " another: And the third, which " proves the Cauſe by the Effect: " The Author made uſe of theſe three " Sorts of Proofs."

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* New Memoirs of Literature, taken from the *Journal des Sçavans.*

" He finds the ſecond ſort of Demonſtration in the Qualities of theſe Waters, and in what may be called their Accidents: He refers thoſe Qualities and Accidents to eight Heads, which are all that can be obſerv'd in them, *viz.* the natural Colour, or the artificial, which proceeds from certain Mixtures; the Taſte; the Smell; the natural or acquired Gravity; the Coolneſs, the natural or artificial Sediments; laſtly, the Settlings which conſiſt of Salt and Earth."

" Theſe eight Heads have perſuaded Dr. *Moulin*, 1. That the Mineral of theſe Waters is chiefly Iron. 2. That the whole Bulk of the Waters paſſes through the ferruginous Mine, and is impregnated with its Atoms. 3. That the mineral Corpuſcles are carried in great Plenty. 4. That the three Springs are very different among themſelves. 5. That in the firſt

" Spring the Mineral is almoſt pure
" Iron; that in the ſecond the Iron
" is vitriolized; and in the third it is
" ſulphurated; that in the three
" Springs the Mineral is partly fixed,
" and partly volatile. 6. That a-
" mong the ferruginous Atoms there
" are nitrous Particles, ſince they
" may be ſeen in the Soil, and the
" Salts of the Waters appear nitrous
" by its priſmatic oblong Figure."

The Doctor has likewiſe, "carefully
" examined the Effects of theſe Wa-
" ters, that he might the better
" know their ferruginous Nature;
" and after he had made many Ex-
" periments to that purpoſe, he ob-
" ſerv'd the ſame natural Effects, the
" ſame Succeſs for the Cure of Diſ-
" eaſes, and the ſame Accidents in
" the Uſe of theſe Waters, as thoſe
" that have been obſerved in other
" Waters, either naturally or artifi-
" cially ferruginous. What makes
" the Demonſtration compleat, is

" that thoſe Reaſons do perfectly " concur to prove the ſame Cauſe, " the ſame Mineral, the ſame Qualities, and the ſame Virtues."

" In thoſe Places where the Waters ſtagnate, one may obſerve upon the Surface ſome ſhining Spots, " which denote the Mineral."

That we may not differ about Terms, a Mineral is a hard Body dug out of the Earth or Mines, being in part of a metalline, and in part of a ſtony Subſtance, and ſometimes with ſome Salt and Sulphur intermixed with the other: And a Metal is ductile and fuſible; being free from recrementitious Parts.

How inſufficient the Colour, the Taſte, the Smell, *&c.* are to denote the Metal? For this is no more than proving that they have the ſame Qualities, and Virtues as thoſe that have been obſerv'd in other *Chalybeate Waters*: Therefore it is only a Conjecture agreeable and in favour of the received Opinion; and not (*de facto*) ſupported by demonſtrable or ſelf-evident Principles.

It is likewiſe a poor Argument to maintain the Exiſtence of the Metal, from thoſe ſhining Spots that appear upon the Surface of thoſe Waters when ſtagnated: For when the ferruginous Matter ſubſides by reaſon of Stagnation, and Evaporation of the fugitive vitriolic *Gas* (which kept it ſuſpended) ſome of the vitriolated Sulphur floats at top in form of a Pellicle, or Webbs of Salt, which is the uſual Sign of an approaching Cryſtallization; and repreſenting the eſſential Colours, which are refracted by a Priſm.

The Author has given us Dr. *Lemery* the Father's Experiments concerning theſe Waters, *viz.* " That " they are vitriolick, are known by " the *Tournſol* which makes the Wa- " ter red, and by the blackiſh Tinc- " ture it takes with Gall-Nuts. The

" other Part, *viz.* That earthy Matter mixed with an acid Spirit, and " joined to a very fine Powder of " Iron-ruſt, is diſcovered by Evapo- " ration." Theſe Experiments appear to me remarkable, in order to confute the Notion; that thoſe Waters keep ſuſpended the Metal: For he proves only the diſengaged Principles of *Mars*, as when reduc'd to a *Ferrugo.*

Here follows an Examen of our *Engliſh* Steel-Waters, by Dr. *Slare.* He is of Opinion " That *Chalybeat* " *Waters* * do not contain any rough " or vitriolic, or acid Salts in them: " And that becauſe it diſſolv'd Soap " and lather'd: † He conſulted his " Palate, and tried whether he could " diſcover any Sharpneſs or Acidity; " but he was far from diſcovering " any ſuch thing: That theſe Waters " ſeem'd rather to leave a ſweetiſh

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* Vid. Philoſ. Tranſ. Abridg'd by *B. Motte.* vol. 2. pag. 219.

† Pag. 20, 24.

“ Flavour or Farewel behind: Thus
“ many Alcali Salts if nicely examined
“ (of the fix’d kind) have affected
“ his Taſte: And having
“ made Experiments with alcaline
“ Spirits; they caus’d no Ferment,
“ nor any Motion or Change in theſe
“ Waters. Then he conſider’d the
“ Diſeaſes in human Bodies, which
“ theſe Waters were preſcrib’d by
“ Phyſicians to cure; that they were
“ often ſuch as proceed from ſharp,
“ acid, or acrimonious Cauſes, as
“ *Cardialgiæ* or Heart-burnings, ſour
“ Vomitings, corroſive Diarrhœa’s,
“ Colicks from Scurvies and Stranguries;
“ and for theſe Diſtempers
“ ſweetning and alcaliſate Remedies
“ are made uſe of. Again, he conſider’d
“ theſe Waters as containing
“ in them the Properties of Iron;
“ and finding by Experience, that
“ it is moſt oppoſite to Acids, being
“ one of their great Correctors,
“ and therefore rather to be eſteemed
“ an *Alcali.*

“ I

" I think we can much better " demonſtrate that the *Chalybeat Wa-* " *ters* do contain ſtyptick and re- " ſtringent Virtues, becauſe they owe " their Birth to the Iron Mineral, " and more particularly to the *Pyrites* " which Dr. *Liſter* ſuggeſts, (not with- " out ſome Reaſon) to be the Pa- " rent even of all Iron Oars, as it is " doubtleſs the Cauſe of all *Chalybeat* " *Waters*: Thus I have often exa- " min'd the Solution of the *Pyrites* " by the Rain-Water at *Debtford*, " and at other Places where Coppe- " ras is made, and found it a very " ſtrong *Chalybeat Water.* "

" Theſe and many more of the " like Experiments (he thinks) have " brought this Controverſy to a plain " and unqueſtionable Deciſion. And " that it cannot be unacceptable to " Virtuoſo's, eſpecially thoſe of the " Faculty of Phyſick, to have this " Medicine fairly examined, its ge- " nuine Properties aſſerted, and what

“ was called an Acid to be demonſtrated an *Alcali.*”

I ſhall make ſome Remarks in reference to the Doctor’s Experiments.

§ 1. That *Chalybeat Waters* are impregnated with vitriolick Salts, is manifeſt from the Tincture it takes from Gall-Nuts, though they diſſolve Soap and lather: For they may be ſo ſaturated with theſe Salts as not to be able to produce this Effect.

§ 2. That the *Criterion* his Palate might be fallible.

§ 3. That they might contain theſe Salts and no manifeſt Fermentation, tho’ mix’d with alcaline Spirits, by reaſon of their ſmall Proportion in regard to the Medium; and its Acidity ſo ſheath’d with its Terra, as not to manifeſt it ſelf: For if we make a Solution of *Sal* or *Vitriolum Martis* (which is prepared with the moſt Acid of Acids) and mix therewith *Spir. Corn. Cervi.* or *Spir. Sal. Armon. volat.* neither of them will cauſe a ſenſible Ferment, becauſe the Salt and Earth are embodied: But this Salt may be turn'd into an acid Liquor, and then it ceaſes to be a *Salſum*; and may be reſuſcitated, or brought back again (with its *Terra*) into its old and natural Form: The following Experiments prove theſe Waters to be acidulated.

§ 4. That theſe Waters mix'd with Galls have a Modification between brown and purple; denotes that they are impregnated with *Mars*: And being mix'd with *Syrup. Violarum* they don't change the blue Colour into a green, but rediſh or purple; therefore they are not alcaline but acid.

§ 5. That tho' Acidity be ſo uſually a manifeſt Quality of Mineral Waters, that Authors are wont to divide them into *Acidulæ* and *Thermæ*, *&c.* 'tis hard to diſcover they have any Acidity, either by their working upon Coral or by any Conflict with Spirit of Urine or the like; or by mixing them with Syrup of Violets, to change the Colour of it; inſomuch that ſometimes I ſhould have concluded ſome ſuch Waters to have no Acidity at all, if I had not had a way of diſcovering a far leſs Degree of it, than I could diſcern it to have by other Trials, *&c.* The beſt way to diſcover the Acidity of Liquors, is by their Operation upon the Colours of an Infuſion of *Lignum Nephriticum* made in limpid Water *.

§ 6. That the Diſeaſes mention'd are not cur'd by their dulcifying Quality, but rather by cauſing a free Oſcillation in the Solids, and Circulation in the ſtagnating Humours; which is the general Cauſe of Acidity in Liquids: But it may indeed in ſome meaſure carry off thoſe acid and acrimonious Particles, as pure elementary Water is wont to do.

§. 7. That they have the Properties of *Iron*, I deny; becauſe we find in them only the diſengaged Principles of *Mars*: And granting that the *Pyrites* or *Copperas-Stones* are the Cauſe of *Chalybeat Waters,* (as the learned Dr. *Liſter* has ſuggeſted) where is the Alcali? For it is ſaid that all kind of Vitriols are compoſed of an acid Salt and ſulphurous Earth: But the Doctor doth allow that they are ſtyptick and reſtringent, becauſe they are impregnated with the *Iron* Mineral, or the *Pyrites*; which are not Properties belonging to alcaline Salts.

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* *Boyle* of Mineral Waters, page 81.

§. 8. Tho' it be the modern chymical Philoſophy that there is no Salt in the natural Compoſition of Metals: And that all the Salts of Metals are only the Metal held *in formâ ſalis* by the ſaline *Menſtruum. viz. Sal Jovis & Saturni* are no more than *Sal Margaritarum* or *Corallii*; (which are deſtitute of eſſential Salts, or at leaſt not to be obtain'd but by the expert in the ſpagirical Art) conſequently if all Metals are ſo, Salt or

Vitriol of *Mars* muſt be ſo: One great Argument for it, is, that if theſe Salts are calcined, *Metalla ipſa reviviſcunt.*

§. 9. Hence they conclude that it is the Metal embodied with the Salts of the ſolvent *Menſtruum*, and not any innate or eſſential Salts. But it is an old Maxim, *Vix generalis regula* ------ In *London* it is well known, that moſt of the Pieces of old *Iron* which are gather'd by many poor People, and the impaired Pieces of Ordnance or great Guns, are ſold to the *Copperas* Houſes at *Rotherhith* or *Debtford*, which they boil up with a Diſſolution of the *Marcaſite Pyrites*, or Fire-ſtone; and let the Liquor run out into convenient Veſſels, in which it ſhoots into thoſe Forms or Cryſtals; we meet with it amongſt the Druggiſts. And,

§. 10. Thoſe acid Spirits which are made uſe of in preparing *Vitriolum Martis*, have not the Properties of Vitriol: Neither will they if poured upon other Metals, produce a Vitriol: So that it is inherent in *Mars*, and not owing to the *Menſtruum.* Moreover *Mars* has ſuch ſuperficial Salt, and is ſuch a vitriolic Body, that altho' it is made into Steel by the more cloſe Arrangment of its Parts, and the ſuperficial ſulphurous Atoms and vitriolic Parts (of which the *Iron* is compounded) are chaſed away from it in Calcination, by which Means it's brought to a more compact Body: Notwithſtanding it will immediately impart with its vitriolic Tinge to any acidulated Fruit, from the Blade of the Knife that divides it: (*Sales non agere niſi ſolutos*) Nay *Mars* will be reduced to a Demi-Salt by the Corroſion of the ſaline *Spicula* of the Air. And it is plain and obvious that it will communicate its Virtues (which wholly conſiſt in its Vitriol) to mild *Menſtruums*, as Water, generous Wine, *&c.*

§. 11.

§. 11. That the whole Body of *Iron* is already in its Nature a vitriolic Body, well concenter'd: And as long as it has that Frame, it keeps the Name of *Iron*; but when Air, active Salts, either acid or alcaline, deſtroy its Texture, the Particles of Matter are ſo unlink'd, and if it were poſſible, diſunite the Trine Dimenſion (*Longum*, *Latum* & *Profundum*, which three Geometrical Dimenſions are neceſſarily united in a ſolid Body) inſomuch that neither the Magnet nor Microſcope can diſcover or make it appear that it is any longer *Iron*.

§. 12. That altho' it may be ſaid according to the School Philoſophy, that it may be divided *ad infinitum*, bearing the ſame Body (as if there was an inſeparable Connexion between its Principles) when finely diluted and ſuſpended in a *Menſtruum*, and that the ſpecifick Coheſion is ſtill the ſame, tho' we can't ſee it, or becauſe it is not obvious to the Senſes.

§. 13.

§. 13. In order to remove this Suggeſtion, and to make a viſible Diſcovery, let us take a Quantity of *Tinctura Martis*, and evaporate away the vinous Spirit, *ad ſiccitatem*, then examine the *Siccum*, after the Manner when it is rang'd and annex'd together as *Iron*; and we ſhall find that Spirit of Salt will not act upon it, no more, than when the Metal is reduced into a Vitriol, or *Ferrugo*; conſequently it has not the ſame ſpecifick Degree of Coheſion, and is no longer *Iron*. And,

§. 14. In farther Purſuit of this Enquiry, let this *Siccum* be diſſolv'd in Water and it will be kept neatly ſuſpended as it was in the vinous Spirit; for you have an entire Solution, the Salts and Sulphurs being concentrated in Union, is the Reaſon of its ready Solution in Water, as all Salts are uſed to do.

§. 15. Theſe Experiments prove that *Chalybeat* or acidulated Waters are impregnated only with vitriolic Particles, as appears by the Trial by Galls, Oak-Leaves, *&c.* And thoſe in ſome Waters are ſuch a *volatil-vitriolic-Gas* *, to wit, that of the *Bath-Waters*, that it flies off as it cools; and altho' you warm the Waters again to the juſt Heat of the Bath, yet it is never to be ſeen more by the uſual Experiments.

§. 16. That I might be better confirm'd in my Opinion, by the concurrent Teſtimony of Experience, (for the moſt plauſible Reaſonings are liable to be overturned by ſome Facts) I deſired Mr. *Godfrey* to examine chymically metallick Tinctures by few Trials, and he doth not allow that they do contain the ſelf-ſame conſtituent Parts or Form, ſuch as *Iron* is, while its Principles are all cloſely annex'd together.

§. 17. For *Tinctura Metallorum*, is a Preparation of *Antimony*, *Mars*, and other Metals, the *Menſtruum* keeps ſuſpended only the ſulphurous and ſaline Parts of them; for the Body of *Mars*, in making the *Antimonial Regulus*, is ſo divided by the Sulphur of the *Antimony*, alcaline Salts, and the fuſible Action of the Fire, that its conſtituent Parts are ſo broke and diſengaged, its Sulphur ſo extended, its groſs *Terra* diſmiſs'd from it (whilſt in Fuſion) therefore it is not the ſame Body as before; for the *Scoria* or Recrement when united with the Sulphur and Vitriol, were the conſtituent Principles of *Iron*.

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* Vid. *Boyle* of Mineral Waters, pag. 98, 99.

§. 18. The Waters of *Hungary* and other Regions * when by the Evaporation of their ſuperfluous Moiſture, will yield Vitriol, a Mineral not compounded but decompounded, as containing in it a ſaline, a ſulphurous, a metalline, and an earthy Part (which it ſelf is none of the ſimpleſt Bodies:) every one of which may be made diſtinctly to appear.

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* Vid. *Boyle* of the Origin and Vertues of Gems. pag. 101.

§. 19. I don't deny but that theſe Waters do contain *Mars in ſolutis principiis*; and that theſe Principles may be reduced to a Metal, by adding thereto a Sulphur: For we find that *Ferrugo*, whoſe Particles are divided and ſeparated by Air, loſes its Nature and Properties with its Form: And *Colcothar* or *Caput Mortuum* of Vitriol, tho' totally deprived of its Spirit, Oil and Sulphur; yet by adding what was carried off by the Air, or chais'd by Fire, it re-aſſumes its metalline Texture and Properties.

§. 20. For it appears by Experiments, that *Iron* contains a Sulphur or oily Subſtance, that renders it bright, malleable, and eaſy to melt: And when it is depriv'd of its Sulphur, if one adds to it a Sulphur like that which was taken from it, from being friable it turns very hard and malleable; which ſhews that it receives its metallick Form from a ſulphurous Subſtance, in appearance no ways different from Oil of Vegetables or Animals; but the Experiment of reducing *Ferrugo* to a Metal, was perform'd by adding ſome *Ol. Lini* to it in Calcination, it became *Iron*, as appeared by the Experiment of the Loadſtone, *&c.*

§. 21. But when the *Ferrugo* or *Crocus* of martial Waters, is examin'd by the Magnet, or Microſcope, or *Spiritus Salis*, &c. we find only the diſengaged Principles of *Mars*: For the Loadſtone will not attract *Crocus Martis* well reverberated, nor will it adhere, but lie therein like Sand, for their Cognation then expireth: But if it be not well reverberated by Fire, and after Ablution, there is a reciprocal Attraction, becauſe in its intime and centrical Particles the Metal may be in its genuine Texture and Properties; but this latter cannot be ſaid of the *Crocus* of *Ferruginous Waters*.

§. 22. From the Sulphur proceeds the Malleability of a Metal, and it is the ſame in *Mercury* as in the four imperfect Metals: For if one reſtores to the *Calx* of *Præcipitatum per ſe*, a Sulphur, by expoſing it again to the *Focus* upon Charcoal, it re-aſſumes immediately its metallick Brightneſs and Fluidity, and becomes Quickſilver; the Coal having furniſh'd it with the ſulphurous Part that the Fire had before taken away.

§. 23. Any Quantity of this Metal diſſolv'd in near double the Quantity of *Spiritus Nitri per ſe*, or *Aq. fort.* may be ſuſtain'd in an incredible Quantity of common Water by adding the Water *gradatim* to the Solution: But we ought rather to take *Aqua diſtillata* which being diveſted or deſtitute of its aluminous cretaceous Earth, or alcalious Particles, will keep it better ſuſpended: For the alcaline Particles would be apt to cauſe a Precipitation.

§. 24. This ſhews how diviſible its Parts are, to diffuſe themſelves in Water, upon Diviſion of its Spheres, their Gravities decreaſe in a triplicate Proportion of their Diameters; but their Superficies only in a Duplicate: Conſequently when grown exceeding ſmall may eaſily be buoy'd up in the Liquor, and tho' the ſolvent *Menſtruum* be diluted, the Force of Coheſion is not ſo weakened, as not to be able to ſuſpend the metalline Corpuſcles diſſolv'd in it:

§. 25. Hence it is evident that all Metals may be rejected as uſeleſs in the *Materia Medica* upon account of their ſpecifick Gravities, excepting *Mercury* alone, which may be ſuſpended among common Water only, by Decoction or Trituration, as is evident from the Diminution of its Weight, and the Effects of the Water.

§. 26. *Note*, the Weight of Bodies in Water by Mr. *Hawksbee*, "† That " altho' the Diſproportions of the " Surfaces of Bodies to their Bulk " of Matter be very great; yet, " that that is the only Reaſon why " a metallick Body ſhould be ſuſ-

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† Vid. Philoſ. Tranſ. abridg'd by *B. Motte*. vol. 1. p. 402.

“ pended in a *Menſtruum* ſpecifically lighter than it ſelf, is very doubtful: For there it ſhould ſeem neceſſary, that where we had ſo great a Difference in point of Superficies, there we ſhould alſo have a Difference ſomething proportional in point of Weight; which did not happen. I think therefore that their muſt be ſome other Agent or Quality, not only to aſſiſt, but to govern in the Caſe: And what we call a corroding *Menſtruum*, &c.”

§. 27. To corroborate this Opinion, we find that the *Dantzick*, *Hungarian*, *Roman*, and white Vitriol have a Proportion of Metal in them: They being prepared with a corroding *Menſtruum*, whoſe Particles by the Corpuſcles of the Metal's attractive Force run into their metalline Embraces and thereby are ſuſpended: Otherwiſe would pregravitate or deſcend, becauſe they cannot be ſupported by the ordinary Gravitation of the Fluid, or the Reſiſtance of the Medium, or by its undiquaque Preſſure: For all Fluids reſiſt or retard the Deſcent of any heavy Bodies thro' them; and that this Reſiſtance is *cæteris paribus* ſtill proportionable to the Surfaces of the deſcending Bodies.

To proceed with *Mars*, there is ſcarce any Styptick even the moſt renown'd *Arcana* or ſecret Medicines; but have for an Ingredient *Mars* of one kind or other diſguiſed.

Notwithſtanding all this, if it can be made to appear that theſe metalline Particles can be mixed with the Blood, and made a Part of the circulating Fluid; it muſt of Courſe by the neceſſary Laws of Motion, from their ſuperior Gravities and Moment, be of greater Force to impel and make their way than Particles of leſſer Gravities.

Admitting of this Propoſition, it will follow by neceſſary Conſequences, that any Metal of greater ſpecifick Gravity, muſt ſtill be more efficacious and more powerful Deobſtruent: But it doth not always follow, becauſe they cannot be made a Part of the circulating Fluid.

There is no Metal to be allow'd of, excepting *Mercury*, that will incorporate with the Blood and become a Part thereof; as appears by its uniting with the Spittle or *Saliva*, by gentle Attrition, and from the Aptitude of its Parts to be comminuted, and to inſiuate themſelves even thro' the Pores of the Skin, and become a Part of the circulating Fluid.

From all theſe Obſervations, I draw the following Conſequence: That ſince it is evident, that *Mars* cannot be convey'd into the Blood, retaining its metalline Texture: And that if it be not pre-diſſolv'd or prepared before it is taken into the Body, it muſt be diſſolv'd *ex prædominio*, acid or alcaliſate, in the Liquors of the Body; ſo that that which is extracted from *Mars*, in a ſolid Form in the

Primæ Viæ by Elixation, can be but the ſame as is perform'd by Art, in a mild *Menſtruum* and very gentle Heat; and what is indiſſolvable and not to be ſuſpended in ſuch, ſhould be judged unworthy to be depended on for the Cure of Diſeaſes.

From theſe Promiſes thus premis'd, it may be the judicious Reader will concur with me in Opinion; that we ought to drop and decline the common *Rationale* of *Chalybeats* operating by their *Pondus*, Elaſticity, or edulcorating Qualities; and that we ſhould reaſon from the Nature of vitriolic Medicines, which is the Baſe, Ground, or Eſſence, and only true Principle of *Mars*.

After I have proved to Demonſtration, that theſe *Hypotheſes* of *Chalybeats* operating by their Gravity, *&c.* have been founded upon wrong Principles, it is but reaſonable to think, ſince we decry the current *Rationale* that we ſhould ſubſtitute another (for I hope I am not ſuch a

Critick, that rather will carp at a Fault, than mend it) ſhewing how theſe demonſtrable Principles perform thoſe wonderful Cures: And that is done in ſo cogent a Manner, reconcilable to their Theory (*Vaſa obſtructa aperiat, & nimis laxa aſtringat:*) that any thing but Prejudice muſt allow it to be brought to a Concluſion.

To come to the Point, bracing the Veſſels in Conjunction with a *Stimulus* anſwers the uſual Effects; For the ſtimulating Quality will cauſe a more frequent Contraction, and increaſe the Propagation, or Celerity of the Blood; its bracing Quality adds to the Elaſticity and ſtronger Vibrations of the Coats of the Arteries; thus by their mutual Re-action one upon another, produces a ſtronger *Ictus*: So that the Blood will be attenuated, and likewiſe edulcorated, becauſe Attrition will divide and attenuate; and no Fluid acquires an Acidity, but either by Stagnation, Adheſion, or Retardation of Motion: After this manner it provokes the menſtrual Diſcharges, and opens the Obſtructions of the Liver, Spleen, *&c.*

Therefore it is not abſolutely neceſſary to produce thoſe extraordinary Effects; that a Medicine ſhould act by Gravity, or cauſe ſuch extreme Tenuity primarily in the Fluid; ſince bracing the Veſſels in conjunction with a *Stimulus* may produce the like Effect, by increaſing the Moment of the Blood, ſo as to ſtrike againſt the Sides of the Veſſels, and break thro'; and this in Proportion to the degree of Impetus and the ſtructure and make of the Veſſels.

The Nature and Property of *Mars*, is to brace and fortify the Solids of the whole Body: And it is well known that moſt of the *Chalybeat* kind prove emetick if over-doſed, by the vellicating Quality of its Sulphurs and Salts: And much more when reduc'd to a *Salſum* with acid Spirits: For the Points of Vitriol of *Mars* when in a *Ferrugo*, (or in a liquid Form prepared with a mild *Menſtruum*) are clog'd with its *Terra*, and not acuated with the acid Salts obtain'd in Preparation: Therefore is not apt to offer Violence and to deſtroy the Texture of the Parts themſelves.

Though *Mercury* and *Mars* are the moſt potent in the Claſs of Deobſtruents; yet how different are our Intentions in Preſcriptions, *Mercury* to enlarge the Capacities of the Veſſels, promote Secretions, by inſinuating into the leaſt pervious Glands, *&c.* And *Chalybeats* to contract them into a narrower Compaſs, corroborating the relax'd State of the nervous Syſtem, which likewiſe ſhews how different are their Properties and Ways of acting, checking all *Diarrhœa's* and profuſe Evacuations, by damming up all the Sluices, incraſſating all the Fluids, inſomuch that ſometimes all the Secretions, are either ſtopp'd by the Conſtrictions, Cramps, and Convulſions begot by them, or at leaſt diſpoſe toward Inflammations, Fevers or Mortifications.

Hence proceeds the Danger of making too free with *Chalybeats* in acute and inflammatory Caſes, and in all Caſes attended with a ſtrong, quick Pulſe, a *Plethora*, or Surcharge of Humours; and where the nervous Fibres are ſcrew'd up, the Blood got into the *Arteriolæ* and capillary Veſſels; for the ſolid, ſpringy, and elaſtick Fibres, Threads or Filaments, will be conſtricted, criſp'd up, and ſhorten'd by the vitriolic Salts, that they cannot give it Paſſage through them; acting like ſo many Wedges, in tearing, rending and dividing the tender *Fibrillæ*, thereby exaſperating, inſtead of ſoftening, ſmoothing, relaxing, and unbending the tenſe and brac'd up Fibres.

But their wonderful Efficacy has been often experienc'd in Cachexies, Scurvies, in the Jaundice, in hypocondriacal and hyſterical Affections, and in all nervous Diſtempers, that proceed from too lax a Tone of the Solids, or where the Blood is viſcid, ſizy, effete and languid, *&c.*

I would not be thought to decry or leſſen the juſt Character and Reputation that *Chalybeats* bear and well deſerve; but rather the contrary: It is only to caution the unwary or thoſe leſs acquainted with their Natures and Properties.

But abſtracting from theſe Conſiderations, I am ſtill of Opinion that we may juſtly accuſe *Chalybeats* as hurtful in ſanguine Conſtitutions, even thoſe that are called Aperitive; (unleſs in Compoſition with either gentle Purgatives or Detergents the one or the other) for the material Principle of Steel being Vitriol (which is allow'd aſtringent in the higheſt Degree) ſtops all the Avenues of the Body, crowds Humours, and prevents the Expulſion of accumulated ſluggiſh Humours, therefore adds to the *Plethora*.

We don't find according to the Eſtimate given of the ſpecifick Gravity of Liquids, that *Chalybeat* Tinctures are any thing ſuperior in Gravity to others of an inferior Claſs: And how inconſiderable are their uſual Doſe in proportion to the circulating Fluid, to ponderate and make its way: And how ſenſible we are of its immediate Effect upon the nervous and ſenſible Parts; to wit, by the Aſtriction upon the Tongue, and the Aſperity and Roughneſs, which always concomitates the Part that is thus adſtricted.

If after all this they ſhould ſay, 'tis in vain to explain this Phænomenon by the Properties of Salts and Sulphurs, and that we are ſtill in the dark as to the Cauſes of this Phænomenon, I think I may ſay, that it is put beyond all manner of doubt, becauſe I am told, and even ſhewn (by experimental Obſervations and demonſtrable Principles) that *Mars* is a vitriolic Body, (and as ſuch admitted into the Blood) and Reaſon ſupported by Experience tells me, that ſuch and ſuch Effects (which are daily produced) ought to reſult from the Action of vitriolic Salts, and being thus view'd with an impartial Eye, may ſerve to prove the Reality of the Cauſe, and make it more intelligible and indiſputable, and eſtabliſh the Truth of it more than a bare Hypotheſis, being founded upon real and not imaginary Principles.

FINIS.

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